for . . .

engineers and contractors controlling the design, specification, installation and maintenance of heating, ventilating and air conditioning.

HEATING & VENTILATING

AIR CONDITIONING

PUBLISHER

THE INDUSTRIAL PRESS

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PUBLISHING INFORMATION

HEATING & VENTILATING is published monthly by the Industrial Press at 148 Lafayette Street, New York, N. Y. Western office, 228 North La Salle Street, Chicago, Ill. Yearly subscription in the United States, Spain, South America, Mexico, and Canada, $2.00; in all other countries, $3.00. Single copies 30 cents.

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Chicago, Ill.

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CONTENTS FOR JULY, 1940

VOLUME 37 NUMBER 7

APARTMENT HOUSE SECTION

$1 of Every $6	21
Ford Foundation	22
Fleetwood Acres	26
Greenwich Apartments	30
Dracker Apartments	32
Village Green	33
Glenside Homes	34
Camac Street, Philadelphia	36
4801 Connecticut Avenue	37
1609 N. Prospect Avenue	38
English Village	40
2601 Parkway	41
Russell House, North	42
Marcy Village	44
Ogontz Manor	45
Cooled Apartments, St. Louis	46
Cross Section of Apartment House Practice	47
Facts and Fallacies in Heating Piping—Part 4	49
Women Much Cooler Than Men	50
Profits in Air—Scott Paper Company	51
Paper Mills Find Heating Towers Profitable	53
Profits in Air—Dust Control—Part 2	54
Reference Data, 177 and 178	58
Abstracts	59
News of the Month	60
New Equipment	67
Degree Day Figures for May, 1940	70
With the Manufacturers	72
Summer Degree Hours, May, 1940	74
Coming Events	74
H & V'S Photos	76
New Trade Literature	76

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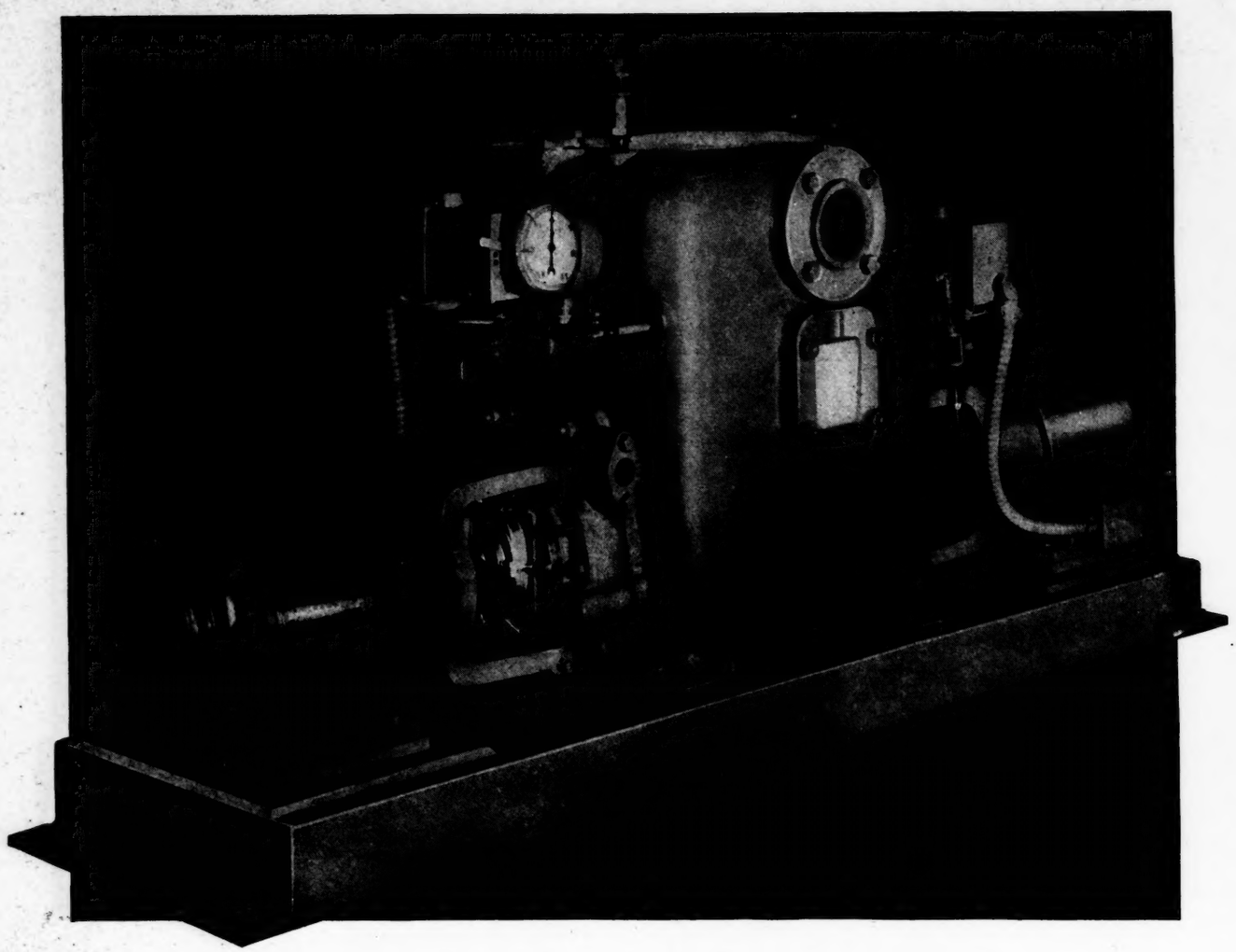

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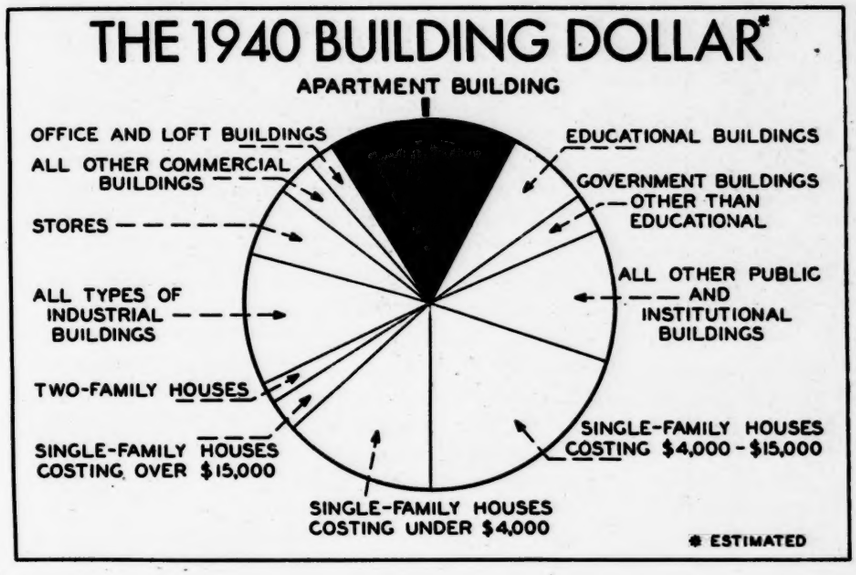
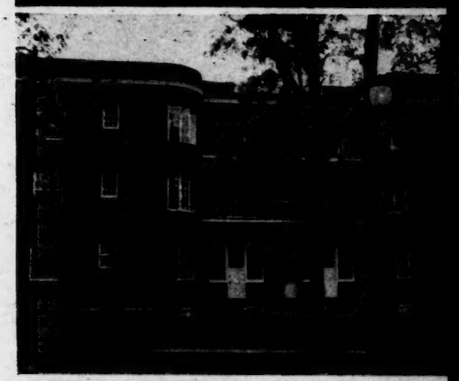


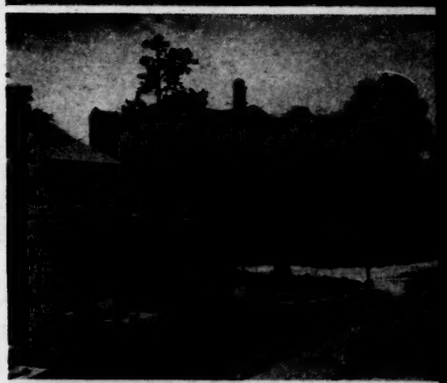
ONE out of every six dollars now being spent for new buildings in this country is for new apartment buildings. It follows that, roughly, one dollar out of every six spent for new heating plants this year is for apartment heating systems.

As the chart shows graphically, no other single type of building accounts for such a large slice of the current building dollar except single family houses. But in single family houses the market for new heating plants is split up among several hundred thousand buyers—a highly scattered market. Moreover, the single house heating market is one in which a considerable portion of the business is for relatively primitive and inexpensive types of heating, especially that part of the market represented on the pie chart by the slice which accounts for single family houses costing under $4000.

On the other hand, the apartment market is a concentrated one; on the average each apartment building includes a considerable investment in heating plant. When a contractor obtains such a contract, or when a manufacturer secures an order for equipment for such a building, it is a sizable one.

Extraordinary activity in any single type of building should result in improvement and progress in practice, technique, and methods relating to that building type. Such progress has taken place in apartment house heating. On the pages which follow this progress is illustrated by 15 case histories of present practice in apartment house installations. None is freakish; none is exceptional in size; none is overwhelmingly expensive. Taken as a whole, they represent a good cross section of 1940 practice in apartment building, heating and air conditioning.





FORD FOUNDATION

DEARBORN, MICH.

Described by
CLIFFORD STROCK

WITH the ultimate objective of providing modern housing for approximately 16,000 persons, a 1069 acre project was begun by the Ford Foundation in Dearborn, Mich., early in 1939. The first unit of this project covering 47 acres in the rolling wooded countryside, cut by a branch of the river Rouge, was completed in March, 1940.

The land being developed is a gift to the Ford Foundation. The proceeds from the improvement of the property are to be used for the furtherance of the objectives of the Foundation, a non-profit corporation organized for scientific, educational and charitable undertakings for the welfare of the public. Edsel B. Ford, B. J. Craig and Clifford B. Longley are Trustees of the Foundation.

The first unit, recently completed, includes 15 buildings containing 203 apartments. Upwards of one and one-half million dollars were spent on this first group. The 15 buildings consist of six apartment type buildings and nine buildings of the terrace type, all two stories in height. In addition there are two buildings which include nine stores and offices for professional men.

In the apartment type buildings each family unit is located on one floor with an identical unit located on the floor above or below. In the terrace type buildings each family unit has its living quarters downstairs and its sleeping quarters upstairs just as in a single-family house, except that the units are connected in rows. In addition, some single-family homes are included in the project.

Beautifully landscaped grounds are devoted to gardens, a heavily wooded park, a 7½ acre school plot with adjoining playground, and parking lot. There are riding stables nearby and the project offers real country living with all the advantages of city life.

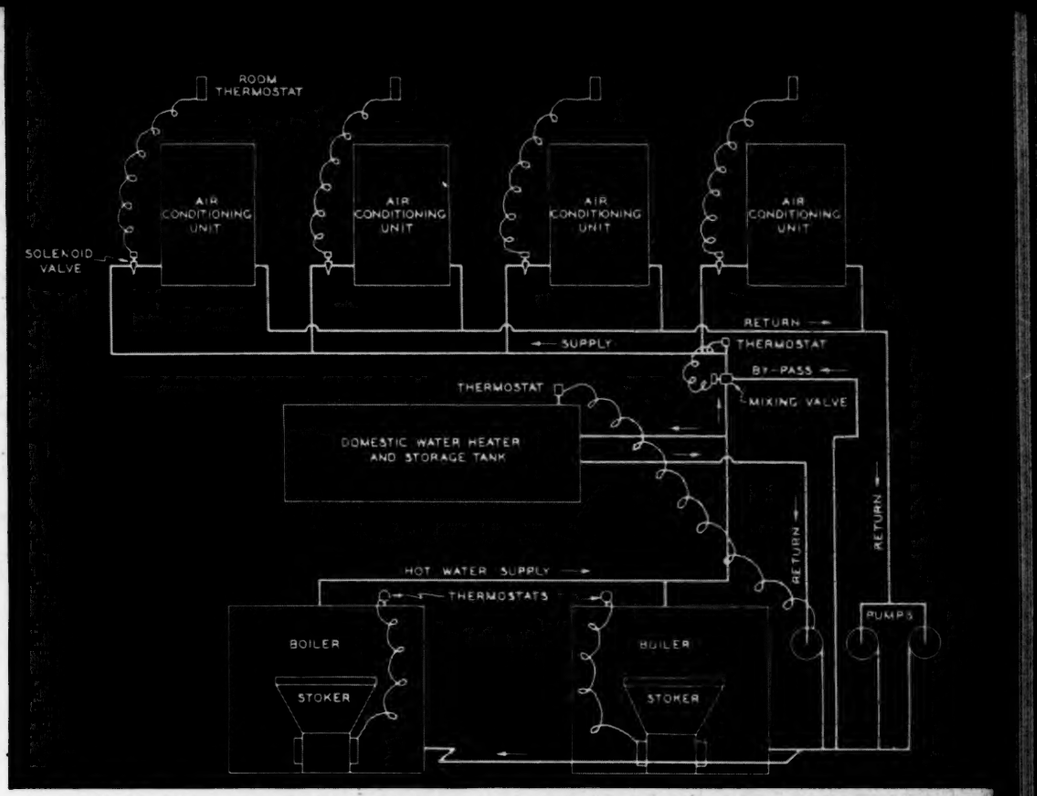
Terrace Type Buildings

There is a total of 80 dwelling units in the nine terrace type apartment buildings. These are heated by individual gas-fired furnaces equipped with a fan, motor, filter, humidifier and controls. Service hot water is provided from a separate gas-fired water heater.

The layout of these gas-fired warm air systems in two typical terrace type units is illustrated. There is an air supply register and a return grille in each of the living rooms, dining rooms, and bedrooms; there is a supply but no return in the bathrooms, kitchens and vestibules. The furnaces are controlled from living room thermostats.

The furnaces were selected on the basis of heating the air from 60F to 160F, and three sizes of furnaces are used depending on the size and exposure of the terrace unit in which it is installed. Fifty-four of the furnaces have a capacity of 56,000 B.t.u. per hour at the registers, supplying a volume of 760 c.f.m., 22 have a capacity of 72,000 B.t.u. per hour at the registers with a volume of 1000 c.f.m., and four have a capacity of 88,000 B.t.u. per hour at the register supplying 1200

The Ford Foundation housing project was designed by Giffels & Vallet, Inc., S. Rossetti, and the Ford Foundation, associate architects and engineers of Detroit and Dearborn, Mich., respectively.



HEATING ARRANGEMENT in apartment type buildings in the Ford Foundation project. Schematic diagram, not to scale, showing the general heating scheme employed in the apartment type buildings. The hot water supply to the air conditioning units is mixed in Speakman mixing valves with return water under Minneapolis-Honeywell thermostatic control, and hot water supply is throttled by solenoid valve under the control of a M.-H. room thermostat. There are three such groups of plants.

c.f.m. The ductwork is supported directly from the steel framework of the building.

Filters are of the dry removable type and the humidifiers are of the pan type. Grilles are of the directional type. Eight-inch kitchen exhaust fans are used throughout.

Apartment Type Buildings

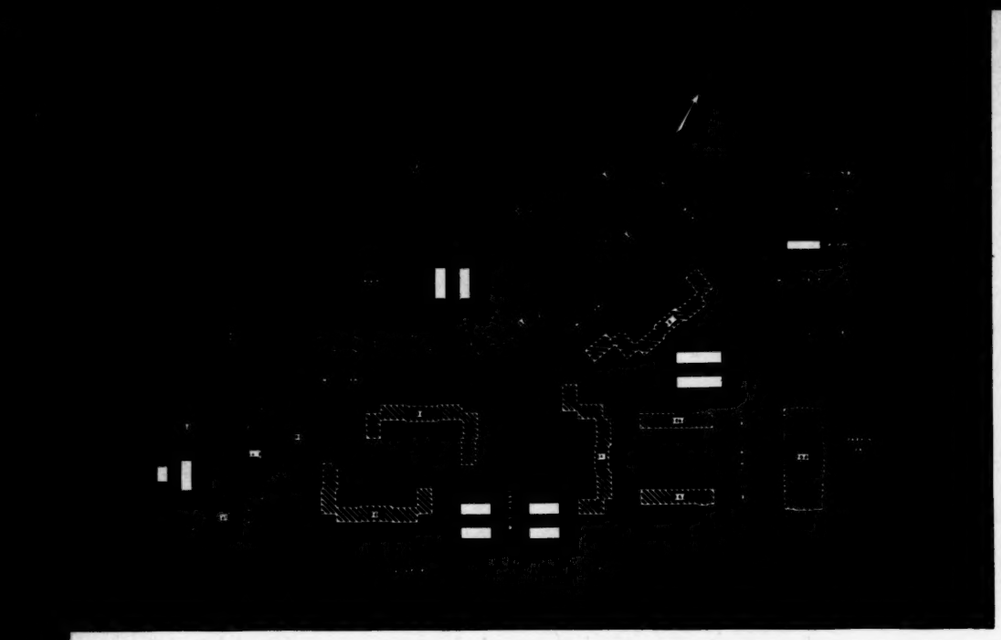
The apartment type buildings are equipped with an air conditioning unit, one in each apartment, supplied with hot water from a central boiler serving a number of apartments.

Each boiler room has two stoker-fired hot water heating boilers and two hot water pumps, a hot water heater and tank combined, and a hot water supply circulating pump. The two hot water pumps circulate water to the air conditioning units, one being under continuous operation in the winter, the other operating on demand. The hot water circulating pump operates on demand from the thermostat in the hot water tank. In order to hold the temperature of the boiler room at a comfortable point a space is provided between the boiler room ceiling and the floor above containing 6 in. of rock wool insulation.

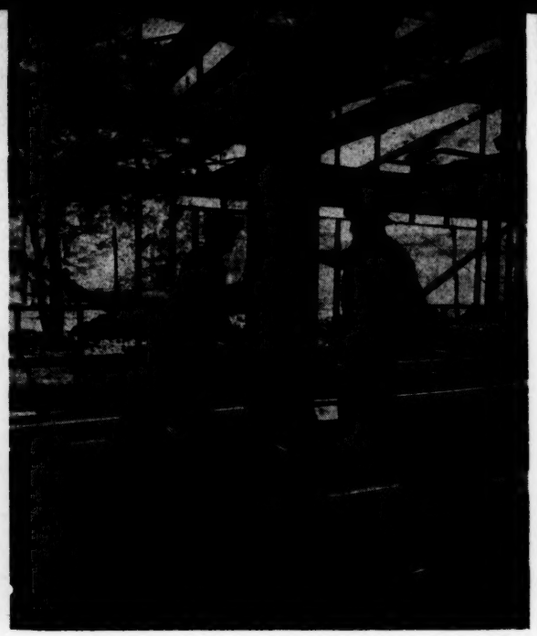
Piping leading from the boiler to the air conditioning units is of steel wherever the sizes are 2½ in. or over, while the 2-in. and smaller piping is Type L copper tubing.

Hot water is pumped directly to the room units through a solenoid valve, and is returned through the circulator to a temperature regulating valve which bypasses part of the return water into the hot water supply line. The pump is hand-controlled but the tem-

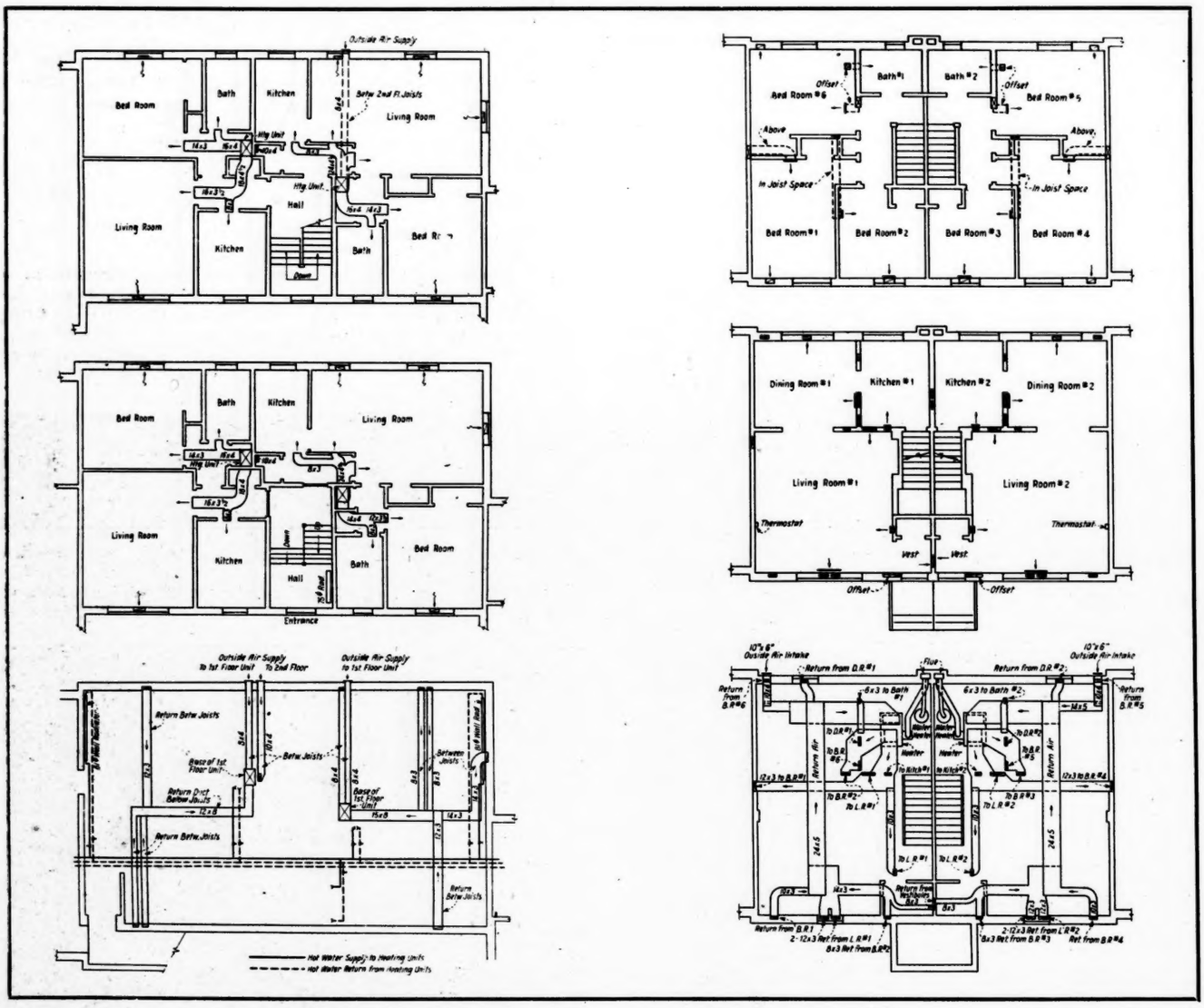
FORD FOUNDATION project will ultimately provide housing for approximately 16,000 persons. Above is shown architect's conception of the first unit while below is the project as seen early this spring. Ford Rotunda and Administration Bldg. in distance.



PLOT PLAN of the first unit of the Ford Foundation project. There are 9 terrace type buildings and 6 apartment type structures in addition to garages and service buildings. This first unit covers about 47 acres.



DUCTS for a General Electric gas-fired furnace installation as used in terraces being leveled while ducts are attached to the steel frame.



FLOOR PLANS in typical Ford Foundation apartments. At the left, is the second floor, first floor, and basement plans of an apartment type building in which each dwelling unit is located on a floor by itself. These are heated by air conditioning units supplied with hot water from a central plant. At the right, are second floor, first floor, and basement plans of terrace type apartments, in which each family occupies two floors. Location of furnace and duct work is shown. Ideal Furnace Company conditioners used in apartments were specially designed for the project.

BOILER ROOM EQUIPMENT IN APARTMENT BUILDINGS

Group	No. of Boilers	Total Sq. Ft. Hot Water Rad.	No. of Stokers	Stoker Capacity, Lb. per Hr. Each	Domestic Hot Water Capacity, G.P.H., Each	No. of Heating Pumps	Heating Pump Capacity, G.P.M., Each	No. of Water Pumps	Domestic Water Pump Capacity, G.P.H.
XI	2	23,000	2	235	1000	2	160	1	34
XIII	2	11,680	2	130	500	2	85	1	17
XIV	2	23,000	2	235	1000	2	160	1	34
Total	6	57,600	6	1200	2500	6	810	3	85

perature regulating valve mixes the cool return water with the hot supply water under the direction of a thermostat in the supply water piping. Stoker operation is controlled from the boiler water temperature. A separate small boiler provides hot water for household use so that the heating boiler and stokers may be shut off during the summer months.

The air conditioning unit heats, humidifies, and filters the air. It is located in a closet space approximately in the center of each apartment and from it ducts lead in the ceiling to the different rooms. Air is recirculated from the principal rooms, excepting the kitchen and bath. Outside air is introduced into the system as required and as illustrated.

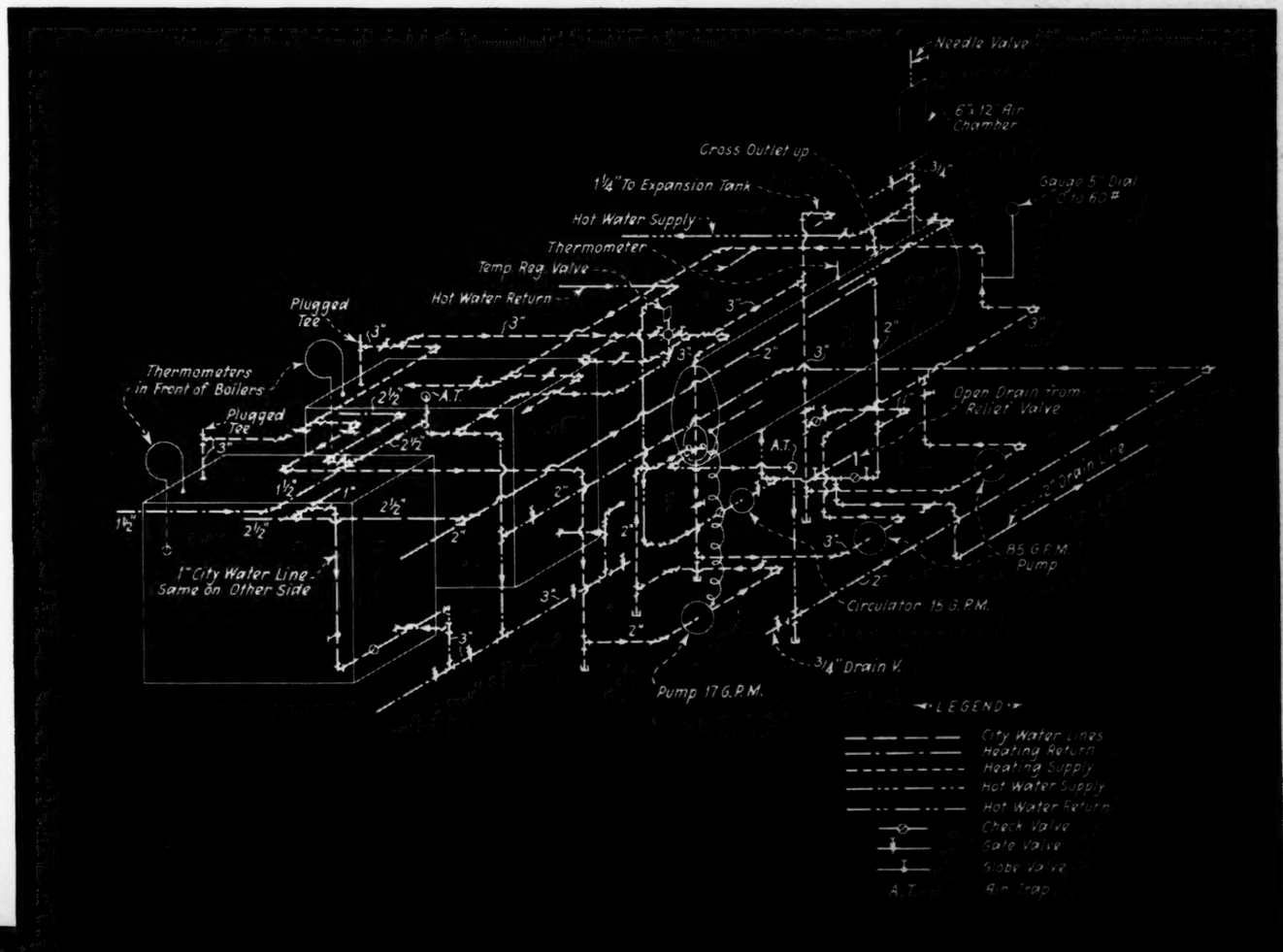
A solenoid valve, located in the hot water supply line, opens and closes under the direction of the room thermostat, and thus controls the volume of hot water fed to the unit.

The air conditioning units were built to order in order to fit the available space. Air enters at the bottom of the unit from the returns which are located under the floor, and from the fresh air supply which is also located under the floor. Filters are of the dry throw-away type, while the humidifier is of the pan type. The coils of the unit are designed to heat the air from 65F to 145F at a velocity through the coil of not over 500 f.p.m. at 1-in. water friction loss.

The coils are intended to be used in the summer for cooling and are designed to cool the air when using well water or mechanical refrigeration. They have a capacity sufficient to cool the air from an 84F dry bulb and a 69F wet bulb to a 60F dry bulb and a 59F wet bulb.

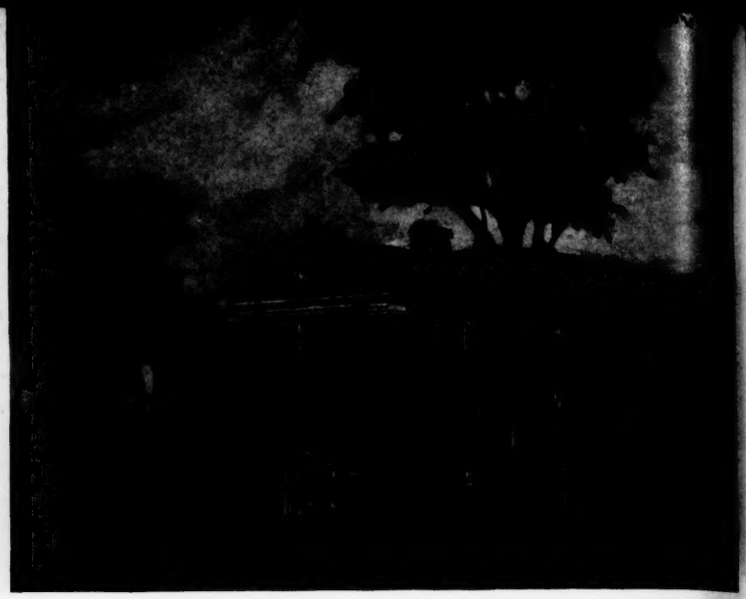
Directional type registers are used throughout the project and in the kitchen of each apartment there is an 8-in. exhaust fan.

PIPING around the National Radiator boilers for the heating system of a typical apartment type building shown in detail. There are four apartment type buildings having a central type heating plant while the other two apartment type buildings are heated from one plant. Air conditioning units served by this system are so located that the return air is supplied to the units under the floor. Heating coils in the units are designed to be used in the summer for cooling and have a capacity sufficient to cool the air from 84F dry and 69F wet bulb to 60F dry and 59F wet bulb. Operation of Schwitzer-Cummins stoker is controlled from boiler water temperature by a hot water limit control.



FLEETWOOD ACRES

BRONXVILLE, N. Y.



Described by
CLIFFORD F. HOLSKE

CONSISTING of three large buildings located on a heavily wooded plot of land in Westchester County, New York, Fleetwood Acres is outstanding among the growing number of suburban apartments but differs from the usual run of such buildings in that the project has a complete system of year-round air conditioning.

A total of 164 apartments are provided in the buildings which are of five and six stories in height while garages for the tenants are located under the terraces and occupy about 30% of the plot. Each apartment is equipped with a unit air conditioner which is connected by short ducts to supply registers in the bedrooms, dining rooms, and living rooms and which supplies all heating, cooling and ventilation for these spaces. The sources of heat and cold water are located at a central point. Return air from each apartment is taken through a ceiling register located near the unit. On page 28 is shown the unit location and duct work arrangement for a typical apartment. Units are mounted in the ceiling of the entrance halls and access doors are located in the floors of the apartments above for convenient servicing. The units used are standard, modified slightly to meet the special conditions of this installation. For instance, the motors are installed inside of the unit casings and the top of the units made removable for servicing from the floor above.

As the units are being used for both heating and cooling, coils are provided which are suitable for the circulating of cold water for cooling and dehumidification, as well as for circulation of hot water for winter heating. Coil sizes and fan capacities are based specifically upon the requirements of the cooling load, as during the heating season a constant temperature can be maintained in the apartments by varying the temperature of the circulated water to meet the requirements imposed by outside weather conditions. These temperatures are regulated by means of three-way mixing valves controlled by thermostats exposed to the outside air. In addition to these master controls, each apartment has a thermostat and a manual control switch with which temperatures may, within limits, be varied to suit the requirement of the individual tenant.

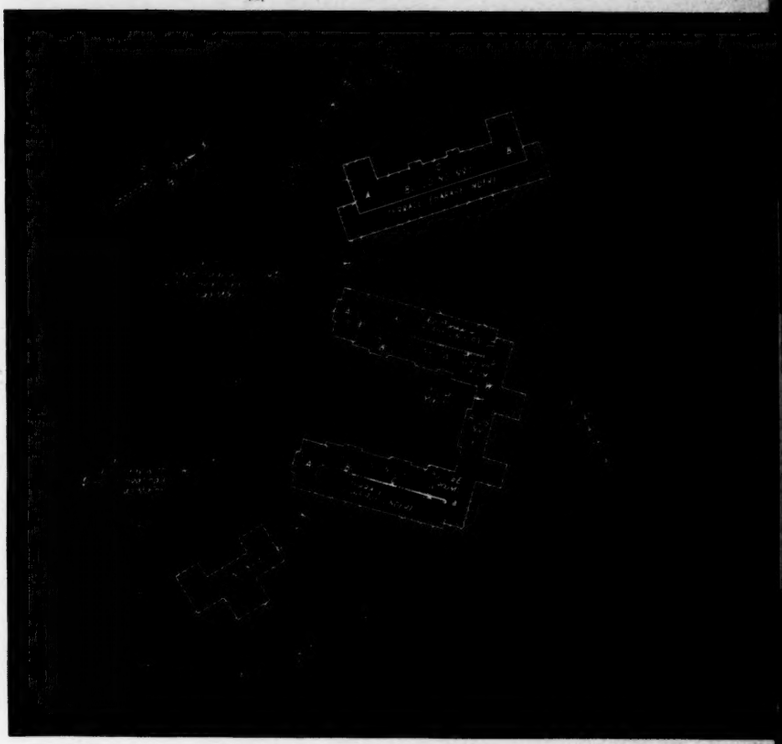
FLEETWOOD ACRES, above. Hall & Paufve, Bronxville, N. Y., were the architects. Heating and air conditioning was designed by Daniel & Wallen, New York consulting engineers, installed by A. B. Barr & Co., Yonkers N. Y.

The water piping from the central heating and refrigerating plants has been run through the basements of the apartment buildings and between buildings is laid in conduit. All piping has been covered with waterproofed felt and the covering properly sealed for both heating and cooling service. The risers which supply water for heating baths, kitchens, stairways, corridors, and garages are valved so that they can be readily shut off during the summer months.

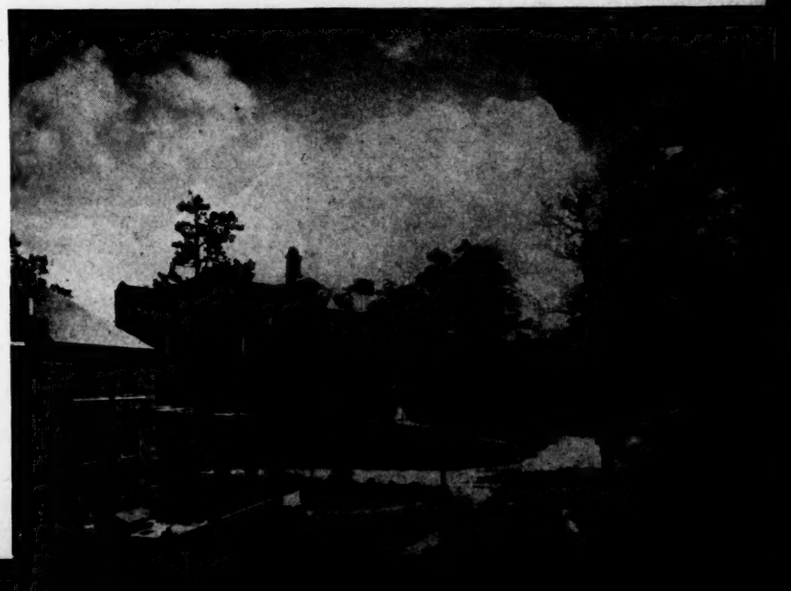
The heat loss for the summer cooling load was computed in the usual manner, a 10F temperature differential and the maintenance of 50% relative humidity being used as a basis. The maximum cooling requirement for the three buildings was estimated to be 250 refrigerating tons.

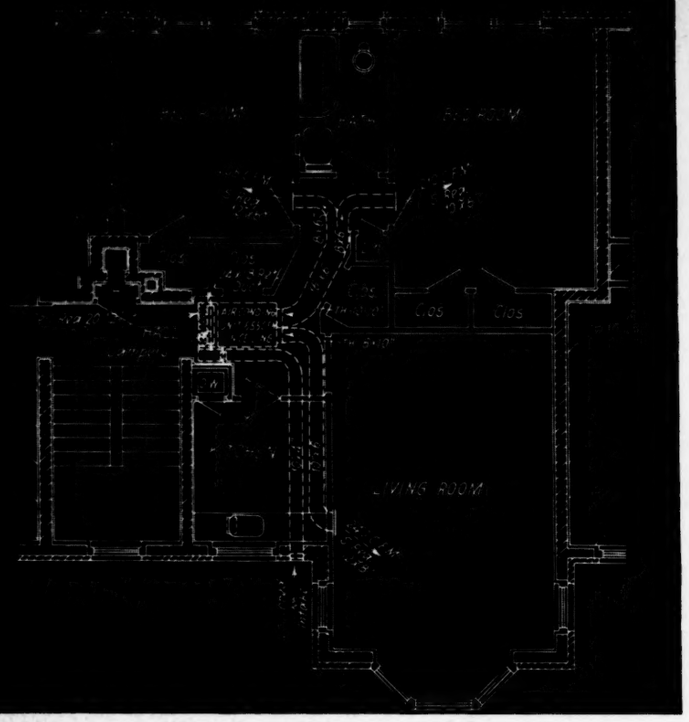
As in all commercial ventures, the design of the air conditioning system was largely dependent on the economic factors involved. It was necessary to provide a system which would increase the revenue sufficiently to show a profit after the depreciation, interest, operating expense and maintenance charges were paid. This, the owners, architects and engineers feel has been accomplished. To supply the refrigeration needed for cooling, several methods were given consideration:

The first type of cooling considered involved use of motor-driven compressors supplemented by chilled water storage tanks. Economically, this system appeared to be advantageous as it would permit shutting down the compressors when the normal electrical demand for lighting was highest and in this manner effect a reduction in monthly maximum demand charges. If sufficient storage capacity were provided it would also allow the use of compressors of considerably less capacity than the maximum load requirement. A complete analysis, however, disclosed that the saving effected by reducing the maximum demand did not justify the use of storage tanks, as the additional power consumed per ton of refrigeration for cooling the water to the lower temperature required for storage offset any possible

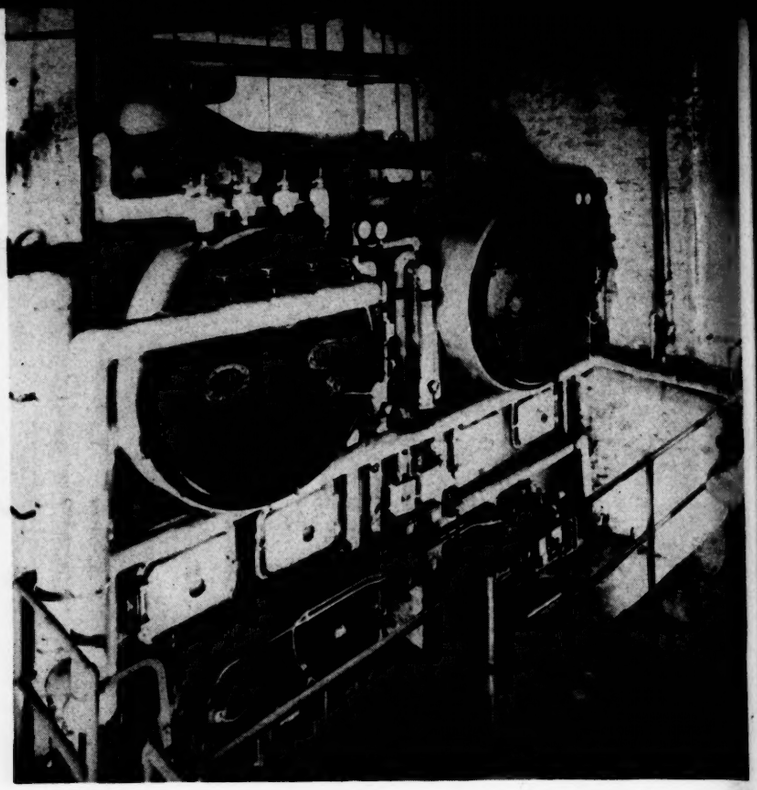


PLOT PLAN of the project, with contour lines showing the elevations clearly indicating the rolling terrain. Boiler plant is located at the corner of the base of the U formed by the large central building while the refrigerating room is located at the opposite corner. Below is a view taken from a location at the upper right of the plot plan. Heavy natural landscaping and winding roads help make this one of the most attractive garden apartments in the New York metropolitan region.

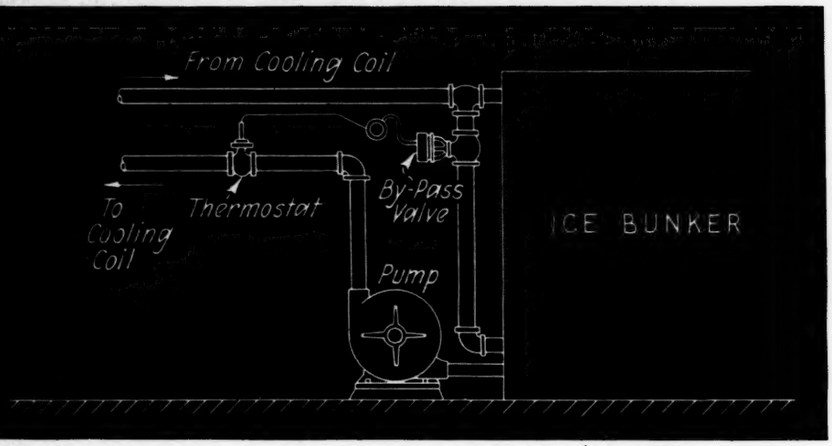




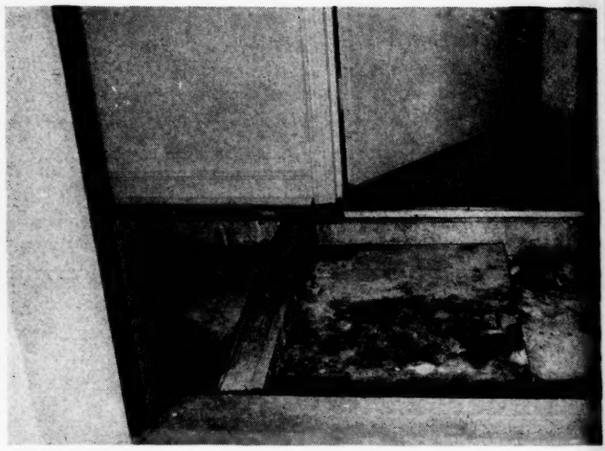
TYPICAL APARTMENT, in plan, is illustrated above. Note the location of the Trane Climate Changer air conditioning unit with connected ducts. There are 164 conditioning units.



HEATING PLANT includes two Pacific steel heating boilers fired by Ray oil burners, shown above. Burners under the direction of Minneapolis-Honeywell controls. Heating system is of forced hot water.

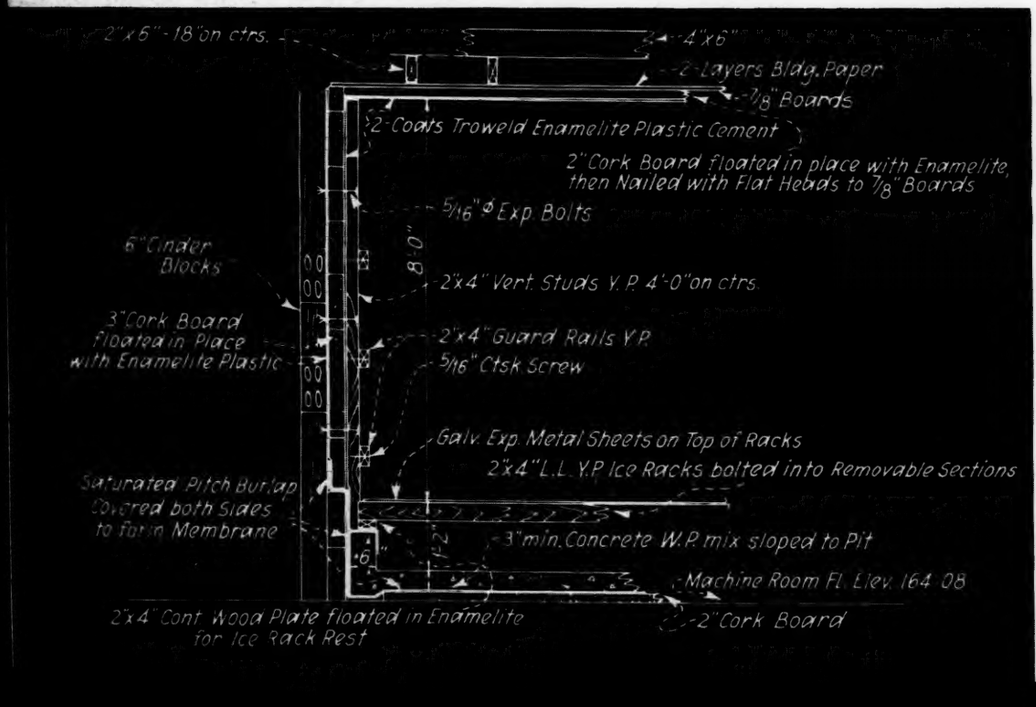


CONTROL for the cold water circulating system for summer air conditioning. Constant supply temperature obtained by mixing with warm return.

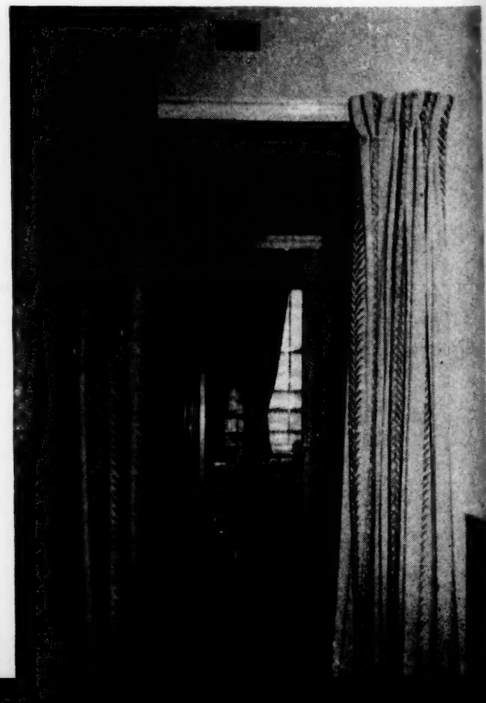


CONDITIONING UNIT, for apartment beneath, is accessible when section of floor in apartment above is removed.

ICE BUNKER construction is illustrated below. The exterior is of 6-inch cinder blocks lined with cork board covered on each side with plastic cement. Ice blocks are placed on wooden racks; warm return water is sprayed over ice, and is thus cooled.


2"x6"-18"on ctrs.
4"x6"
2-Layers Bldg. Paper
7/8" Boards
2-Coats Troweld Enamelite Plastic Cement
2" Cork Board floated in place with Enamelite, then Nailed with Flat Heads to 7/8" Boards
5/16" Ø Exp Bolts
6" Cinder Blocks
8'-0"
2"x4" Vert. Studs Y. P. 4'-0" on ctrs.
3" Cork Board floated in Place with Enamelite Plastic
2"x4" Guard Rails Y.P.
5/16" Ctsk Screw
Galv. Exp. Metal Sheets on Top of Racks
2"x4" L.L. Y.P. Ice Racks bolted into Removable Sections
Saturated Pitch Burlap Covered both Sides to form Membrane
3" min. Concrete W.P. mix sloped to Pit
Machine Room Fl. Elev. 164.08
2"x4" Cont. Wood Plate floated in Enamelite for Ice Rack Rest
2" Cork Board

SUPPLY GRILLE for serving dining room is shown below. Large grille in ceiling is return grille to air conditioning unit in ceiling.



savings. Compressors driven by Diesel engines were also considered, but the higher first cost with consequent increased fixed charges disqualified this type of equipment.

Motor-driven compressors operated on a standard indirect expansion system were found to require too great an investment, while the cost of employing a crew of skilled operating engineers during the cooling season would also tend to increase the cost per ton of refrigerating effect developed.

Use of purchased ice was considered to be the most advantageous cooling method, as with such a system the first cost of the refrigerating plant becomes negligible and interest, depreciation, maintenance and operating attendance are virtually eliminated. The ice storage and water cooling plant is located in a garage below building No. 2W.

The bunker when completely filled has a capacity of 53 tons of ice, although it is quite probable that in practice it will never contain more than 40 tons of ice at any one time. Bunker construction details are shown at left. Ice is delivered in trucks having a capacity of 10 tons each and one or more daily deliveries are made as may be required to meet the needs for cooling. It is estimated that a satisfactory cooling job can be accomplished with an annual consumption of approximately 2500 tons of ice, although there is a possibility of a variation of as much as ± 20% depending upon weather conditions and upon the degree of cooling that is found to be most desirable.

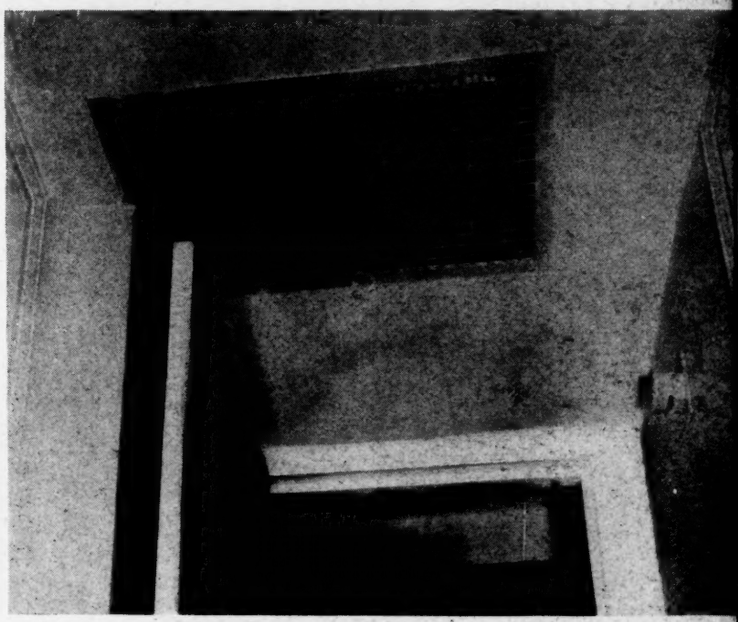
The water temperature is kept constant, regardless of the amount of ice in the bunker or the rate at which refrigeration is required, through the use of a by-pass valve actuated by an immersion type thermostat in the circulating water line. See sketch. Cold water for summer operation is circulated through the mains used for heating in the winter although a separate pumping system is used in each case. To change the system from heating to cooling and dehumidifying, it is only necessary to close the valves at the boilers and open the valve to the cold water circulating pump.

All baths, kitchens, stairways and public corridors are heated by direct radiators. The garages are provided with unit heaters. Heat is supplied to the ventilating units, direct radiation and unit heaters by hot water, which is circulated by pumps through a two-pipe system of mains from the central heating plant. Water for the heating system is heated by two steel hot water boilers, each having a capacity of 125 hp. and fired with a fully automatic oil burner which burns No. 6 oil at a maximum capacity of 125% of the boiler rating. The total estimated heating load is 20,000 sq. ft. of equivalent direct steam radiation.

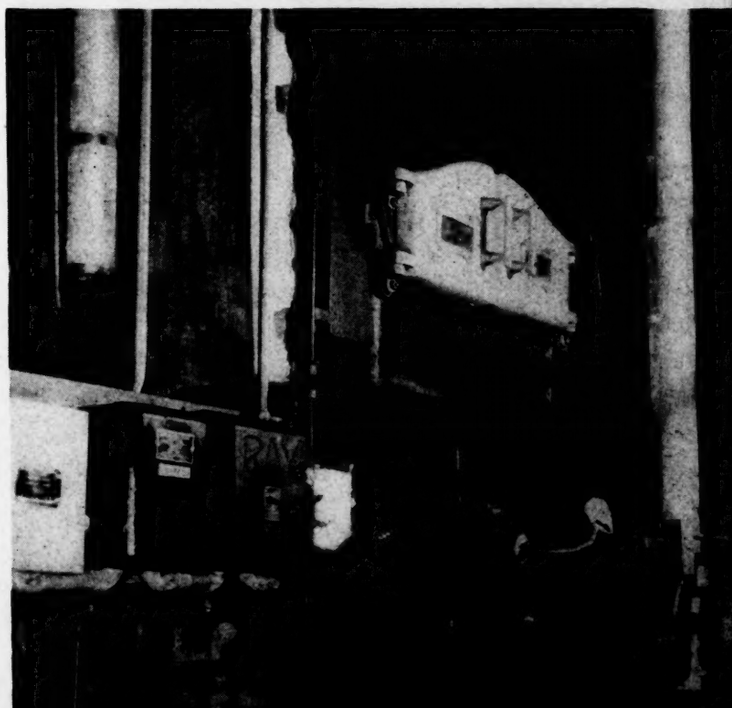
Domestic hot water is normally heated by a separate cast iron hot water boiler, but hot water heating coils have been provided in one of the heating boilers for emergency use.

It is felt that with the design and with the equipment selected the owners have successfully solved the problem of providing air conditioning in addition to all of the services normally required in a high-class apartment building, at a cost that will make this investment in equipment a profitable one.

LIVING ROOM supply grilles can be seen near ceiling in view above. Close-up of return grille to Climate Changer is illustrated below, in view from hallway in center of apartment. Conditioner provides heating, cooling, cleaning and circulating.



OT WATER BOILER, by H. B. Smith Co., Inc., with Ray oil burner, below. Underground piping in project is carried in Ric-wiL conduit, has Howard expansion joints in line.



GREENWICH APARTMENTS

SEATTLE, WASH.

Described by

MERRILL N. MUSGRAVE

MODERNIZATION CUTS FUEL COST AND IMP

THE climate in the Pacific Northwest is peculiarly different from that in the East and Midwest, especially from the heating engineer's standpoint. Seattle, for example, has a winter design temperature of +20 to +30F as compared with 0 to —10F for Chicago, while degree-days average 4968 for Seattle and 6315 in Chicago. The average monthly range of degree-days in winter months is from 403 to 775 per month, but from 248 to 1262 in Chicago. Under these conditions it is comparatively difficult to show a fuel saving with proper temperature control equipment in Seattle as compared with Chicago, because in the latter area, a heating plant is operated approximately only 25% capacity most of the time but in the Seattle area, the plant operates at 45% of capacity most of the time.

However, one instance of where temperature control equipment has been successfully applied in the Seattle district is that in the Greenwich Apartments. This is a three-story 36-suite building, heated by No. 5 fuel oil. The temperature was originally controlled by a room thermostat in one apartment and a conventional damper motor operating a balanced valve in the boiler room. The system operated on 2 lb. steam and domestic hot water was obtained from a steam coil heater immersed in a storage tank. Two automatic time switches shut off the burner and the vacuum pump at night.

This system was not satisfactory because the room in which the thermostat was installed did not reflect the average temperature conditions throughout the building so that the other 35 tenants were given a temperature condition depending on that demanded by the thermostat in one tenant's apartment. Furthermore, the lag in the heating system was considerable and the thermostat was being used merely as an on-and-off switch, depending on the complaints or lack of complaints from the other tenants.

The result was that the heating cost of the building was high for three reasons: (1) in order to avoid tenant complaint, the building was overheated; (2) tenants opened the windows in attempts to reduce air temperatures rather than shut off radiators, and (3) since the hot water storage was exhausted during the night, the tenants would leave the hot water run for long periods in an attempt to obtain hot water.

The writer's company placed a number of recording thermometers in various apartments, allowing them to run for several days at a time in order to determine what temperature conditions inside would compare with those outside. These records showed that whenever heat was cut off from the building, the radiators cooled rapidly, resulting in a "cold 70" condition.

Based on the findings, it was decided to install a temperature control system which would function automati-

†President, Harrison Sales Co., Seattle, Wash.

MPROVES TEMPERATURE DISTRIBUTION

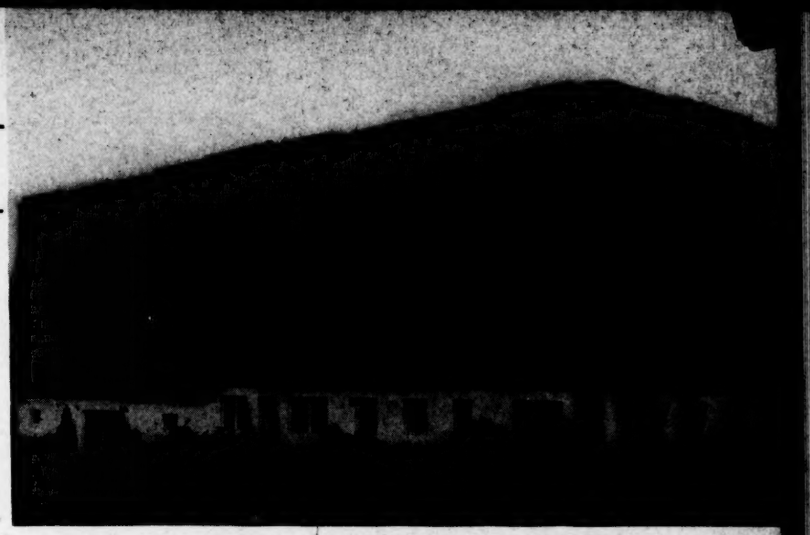
cally, and to fire the boiler 24 hours a day so that the domestic hot water supply would be continuous to eliminate the heavy draw each morning.

The first change was accomplished by installing a temperature control system consisting of a motor-driven outdoor thermostat and cycler, motor-operated steam valve, time switch, and surface thermostat. The building originally was piped in a single zone so that additional zoning was not practical but fortunately all sides of the building were equally exposed, and in this locality there is a normal absence of wind and intense sun so that the lack of zoning was relatively unimportant. The continuous firing of the boiler was accomplished by removing the time switch from the oil burner circuit so that it is controlled by a pressure switch on the boiler.

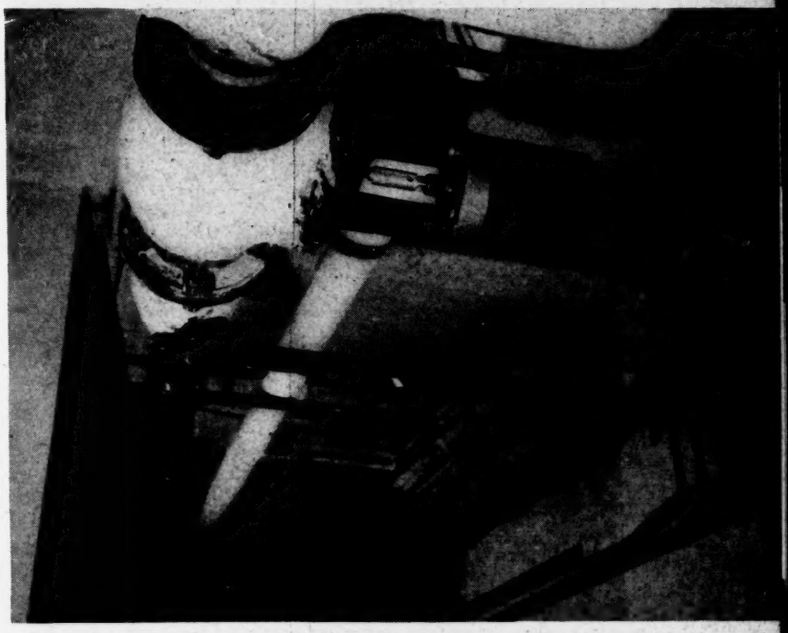
The entire temperature control system is low voltage and operates as follows: (1) the morning heat-up period calls for very long open and very short closed cycles of the steam valve until the building has been warmed up from the night low temperature to the desired daytime temperature. When this temperature is reached, the control goes into its regular cycle of operation which opens the steam valve at frequent enough periods and for a long enough time at each period to keep the radiators at an average temperature which is required to heat the building. As the outside temperature rises, the open periods of the valve are decreased and the closed periods are increased, and the reverse holds true as the outside temperature falls. At night the system automatically cuts back to low night temperature, and maintains the lower temperature until the following morning when the cycle is repeated. One of the very interesting features of this system is the fact that the system is always under the control of the outside temperature during the night, during the warm-up period, as well as during the day-time period. It does not depend upon an indoor thermostat at any time.

The surface thermostat was placed on the end of the steam main to assure steam reaching the end of the system each time the steam valve is opened. The whole control system was adjusted so that when the outdoor temperature reaches 70F, the steam valve is closed at all times and when the temperature drops to +20F, the steam valve remains open. At intermediate temperatures the valve is open and closed for proportionate periods of time.

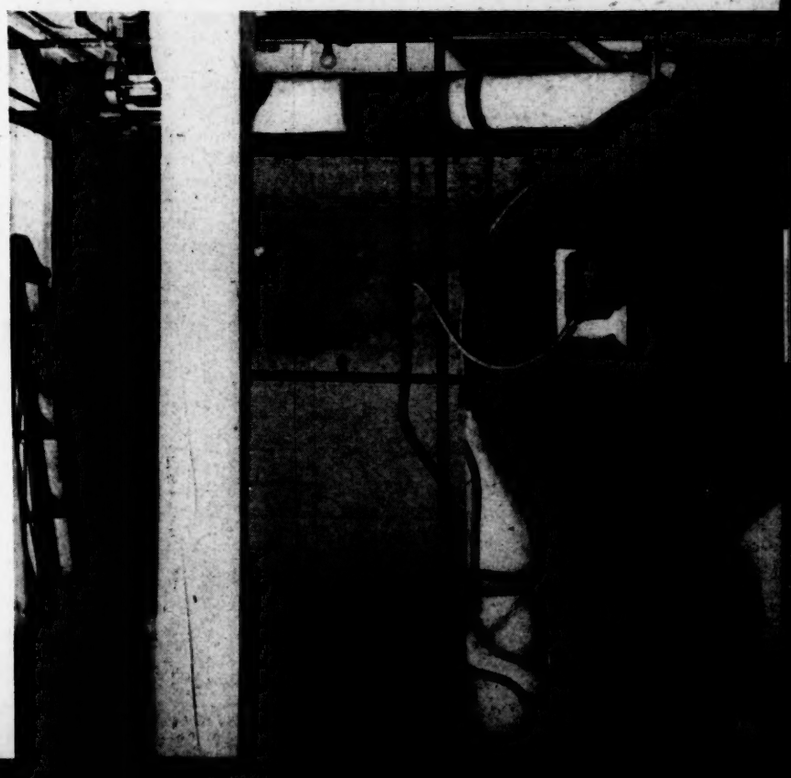
Following installation of the control system, temperature records were again made and conditions inside were found to be quite satisfactory. A few records showed that under the new arrangement, the fuel cost was 0.1855 dollars per degree day as against a previous fuel cost of 0.2584 dollars per degree day, a saving of 28.2%. In other words the entire cost of the new system will be amortized within the year.



GREENWICH APARTMENTS, Seattle, in which a Barber-Colman Econostat temperature control system sharply reduced fuel costs and improved the air temperature conditions throughout.



AUTOMATIC STEAM VALVE, above, which, under the control of an outside thermostat and time switch, permits steam to enter radiators at intervals to maintain desired average temperature in radiators, depending on outside temperature and time of day. Below is the Birchfield boiler and Ray oil burner, with the Barber-Colman steam valve at upper left. Controls are low voltage.



ELECTRIC HEATING was selected for this Spanish-Moorish type apartment in Los Angeles. The heating system consists of 157 Thermador fan-type electric space heaters. The system has a connected load of 355½ kw. Heating in southern California has a heavy demand only in the three winter months but mild heating is necessary in both the spring and fall.

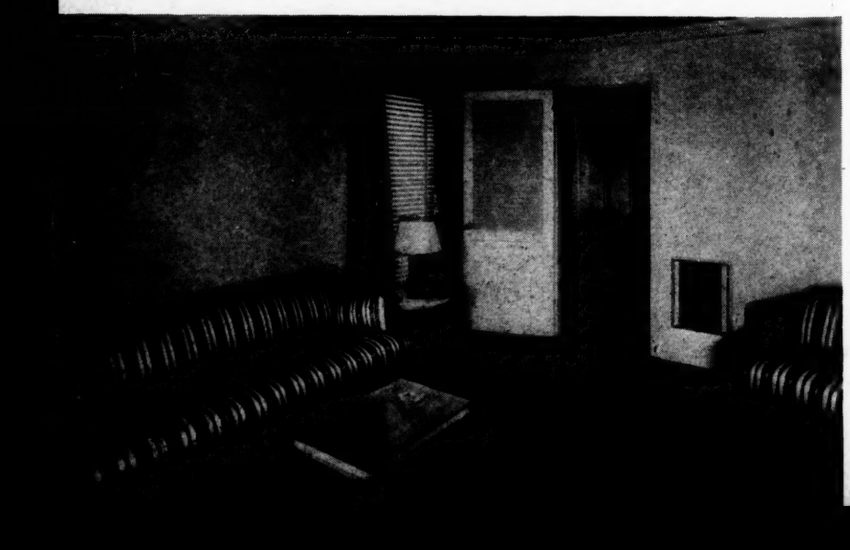
DRACKER APARTMENTS

WEST LOS ANGELES, CALIF.

THE Dracker Apartments is representative of a current trend in southern California toward the use of electricity as the heating medium in multi-unit apartment houses. Heating in southern California is only a three-month proposition. Demands for heat by apartment dwellers seldom occur other than in December, January and February, and—during exceptionally cool springs—in the early part of March. During the other nine months of the year an apartment house heating system represents an idle investment unless it can also be combined to do double duty as a ventilating system in the hot seasons.

There are no apartment houses in Los Angeles with refrigerated air conditioning systems. The general coolness of the summers (average temp. 70 F.) makes it possible to obtain sufficient ventilation with fans installed in wall space heaters. Owners of the larger new apartment structures therefore are showing a tendency toward favoring the inexpensive, double-utility fan-equipped wall-unit system.

ROOM UNIT in the Dracker apartments. An aluminum-blade fan back of the grille forces air over the electrically heated coil. The fan motor draws 39 watts in the unit shown, which is thermostatically-controlled. The heater can be cut out and the fan used to circulate air through the rooms in the summer.

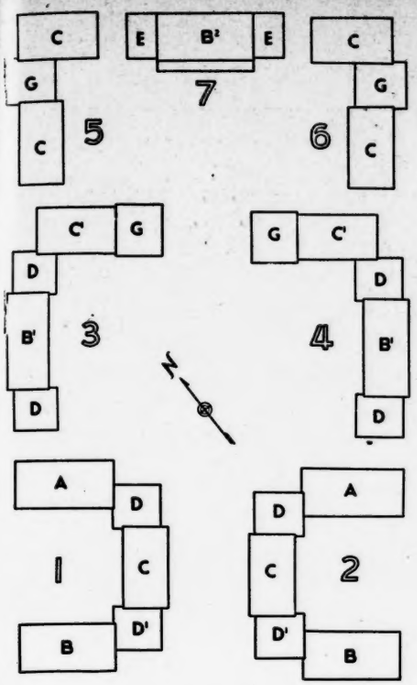


The heating system consists of 157 individual room space heaters of the fan-type, wall-insert model. There is one master duty heater in each room, mounted in the wall 11 inches above the floor, and one special type wall heater in the bathrooms. The room heaters measure 14⅛ in. in width by 18⅞ in. in height and have a depth of four inches. An aluminum-bladed fan is installed between grille and heating coil. The motor capacity of the room heaters is approximately 39 watts at full load speed of 620 r.p.m. for 50 or 60 cycles. Motors have thermostat control, with a throw-over switch for cutting-in or shutting off the heat coil.

The entire heater installation of the building is carried on a connected power load of 355½ kw.

The Dracker's combination heating and ventilating system has demonstrated its effectiveness through one summer and one winter. Its air-cooling qualities received a rigid test in September, 1939, when temperatures in Los Angeles soared above 100 F for ten successive days. It stood up, too, to the recent four-month winter heating test in all requirements, according to a report by the owner to the Los Angeles Bureau of Power and Light.

The system was installed by Robert F. Zaayer, heating and electrical contractor, Los Angeles. The general building contractor was John L. Hudson of Los Angeles.

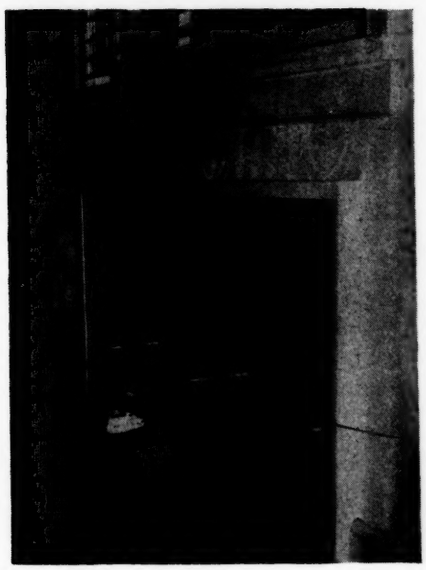


PLOT PLAN of Village Green showing the seven groups of buildings which constitute the project. A heating plant is provided for each group. Below is shown element of a typical copper convector with casing removed.

CONVECTOR, by Trane, shown in a typical living room in Village Green. There are a total of 29 buildings, containing 86 apartments, ranging from 3 to 5 rooms per apartment. Rents average $19 per room. McMurray & Schmidlin, Union, N. J., were the architects. The heating contractor was Joseph Shur, Linden, N. J. Frank H. Taylor & Sons, E. Orange realtors, were the sponsors and Commonwealth Building Construction Co. the contractors. There are 86 apartments with 3-5 rooms each.

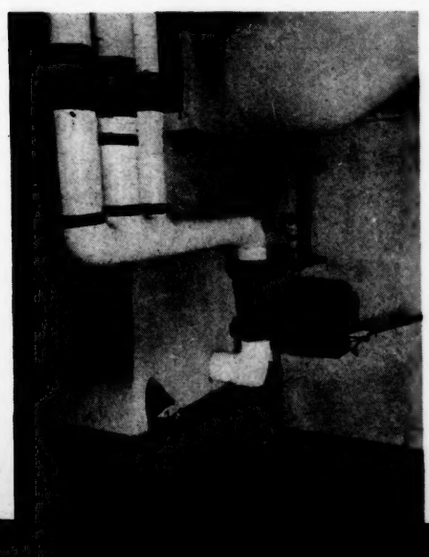
VILLAGE GREEN

ORANGE, N. J.



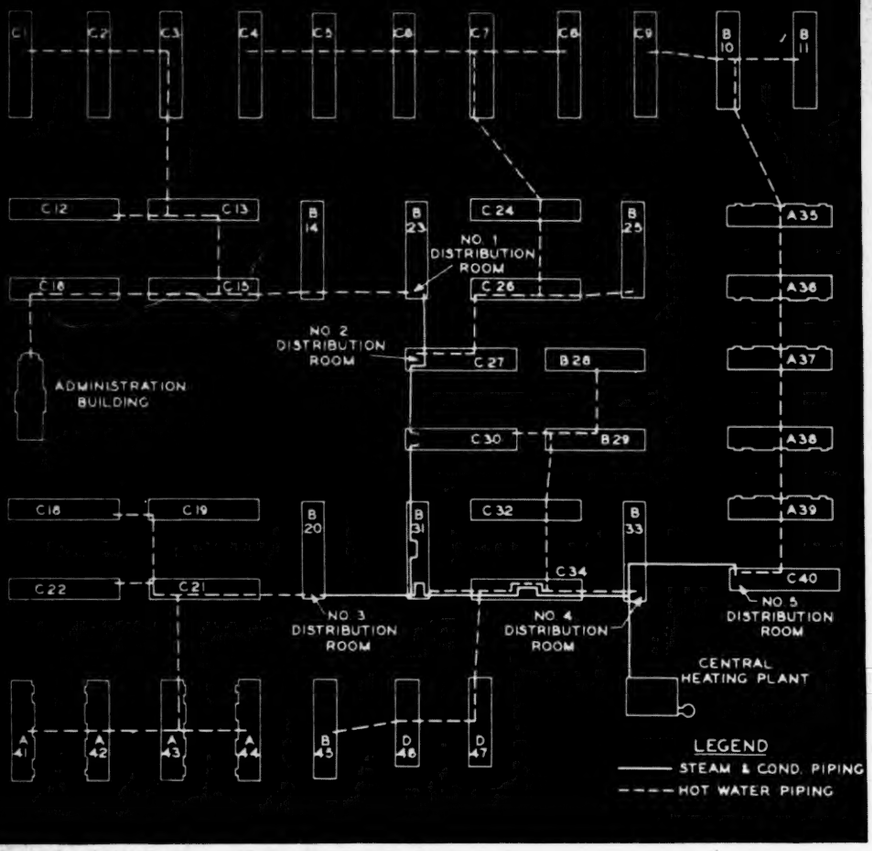
STEEL BOILER, rear, below, showing the B & G hot water circulator in the plant serving group 4. No. 5 oil is burned in Petro burners. Bell & Gossett hot water specialties were used throughout. Boiler by Fitzgibbons.

VILLAGE GREEN, portions of which are illustrated above and below, covers approximately four acres at Main St. and Manor Terrace, Orange, N. J. Heating in each group is of the one-pipe forced hot water type.

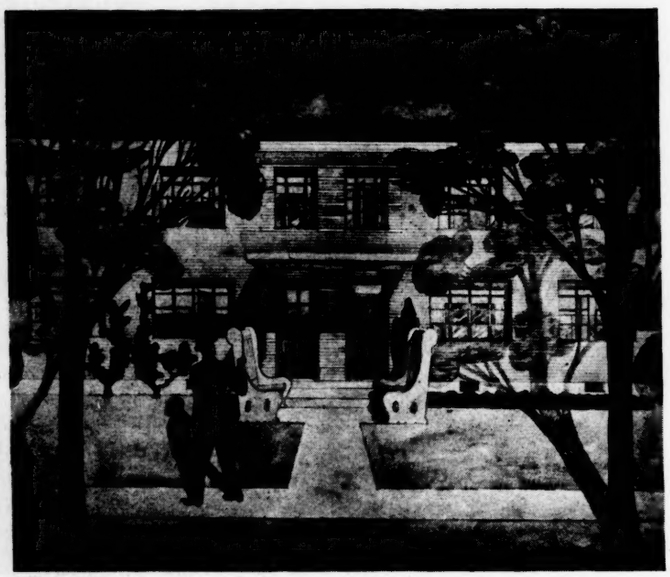


GLENSIDE HOMES

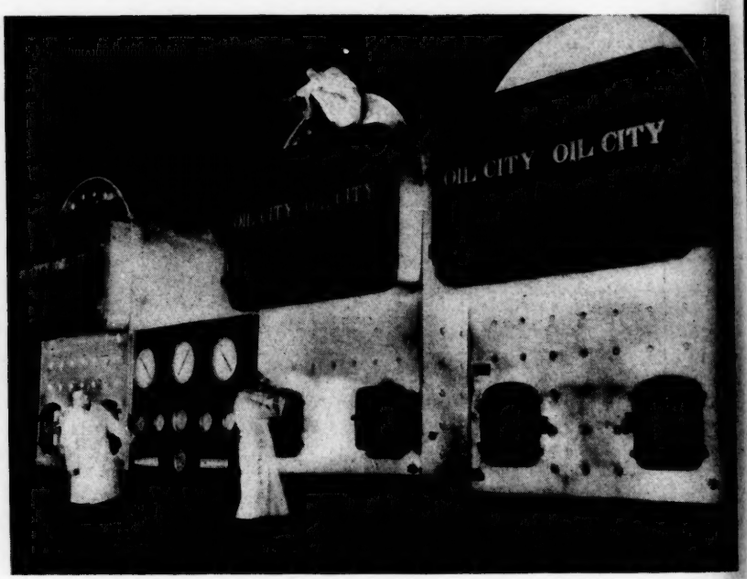
READING, PA.



PLOT PLAN of Glenside Homes. Steam flows from central plant through pipe encased in H. W. Porter & Co. Therm-O-Tile conduit to distribution rooms, steam heats water which is circulated through Therm-O-Tile conduit to apartment-type unit heaters in individual dwelling units. Register & Grille Company registers are used as outlets in each apartment.

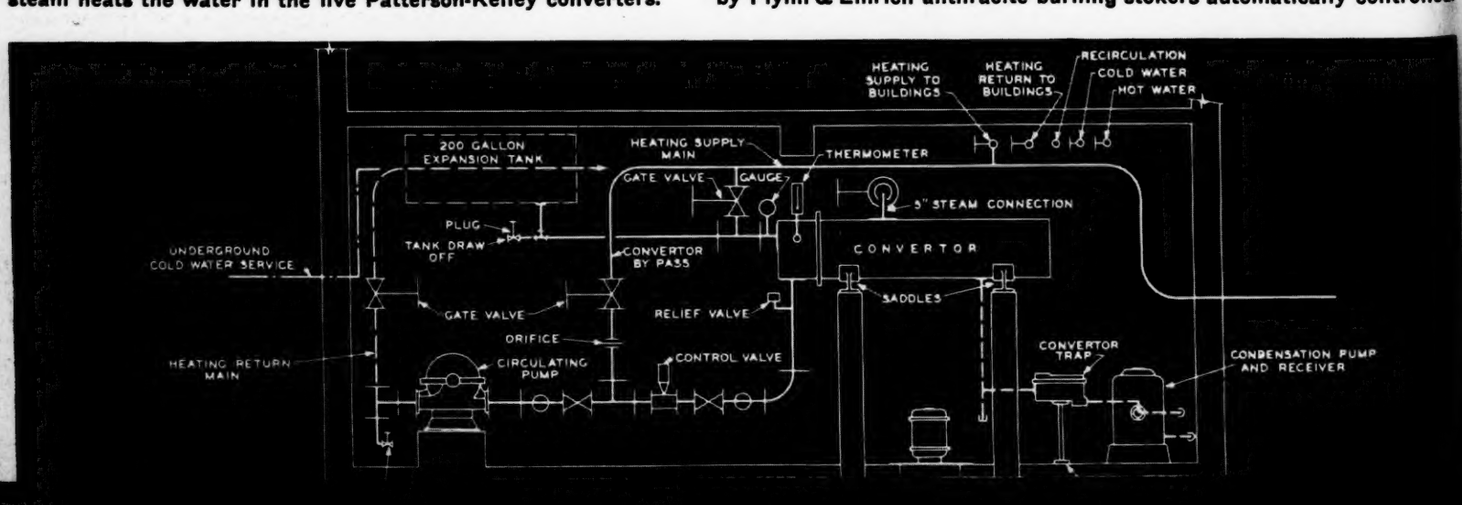


FRONT ELEVATION of interior portion of dwelling units. Buildings are all two-story. Harry Maurer, Reading, was the architect. Heating designed by A. E. D'Ambly, Philadelphia.

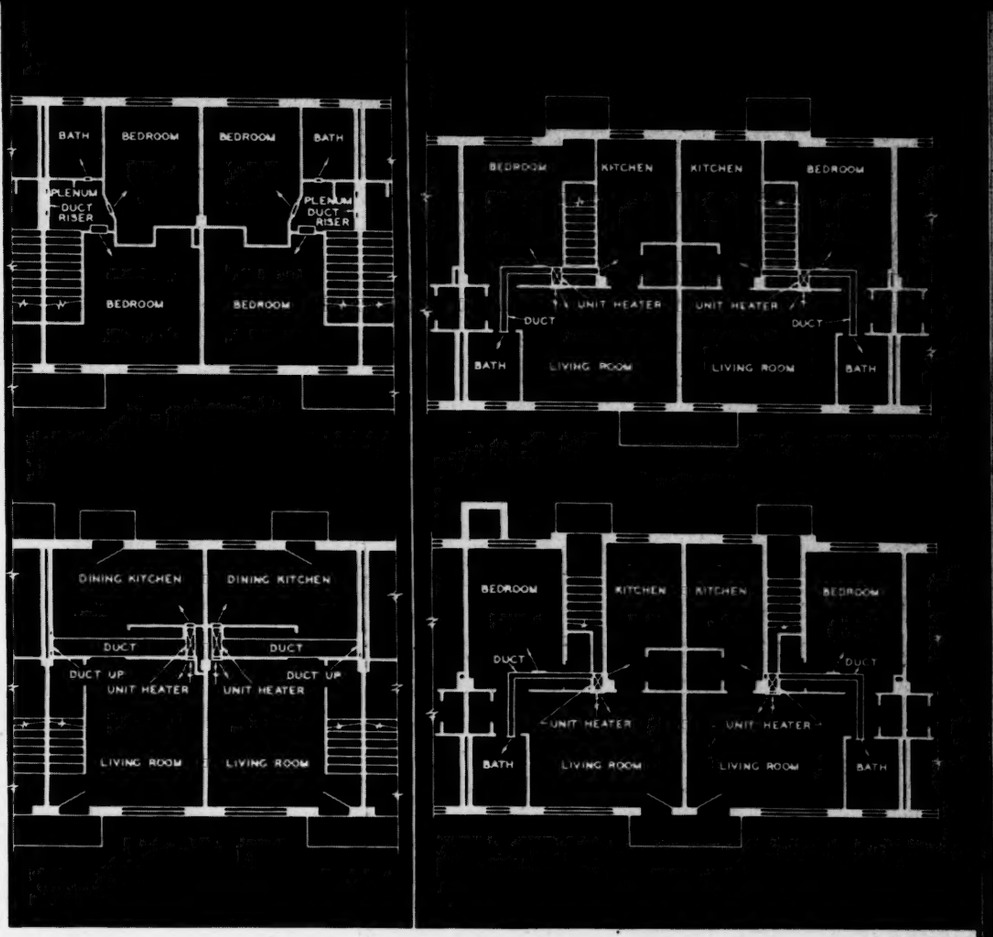


BOILERS for the Glenside Project undergoing laboratory tests, above. These boilers, made by Oil City Tank & Boiler Co., are reported to be the largest low pressure steel heating boilers ever built, each having over half a mile of steel tubes, approximately 60 sq. ft. of grate area each, and a capacity of 43,000 sq. ft. of radiation each. Boilers are fired by Flynn & Emrich anthracite burning stokers automatically controlled.

DISTRIBUTION ROOM arrangement, below. Low pressure steam heats the water in the five Patterson-Kelley converters.



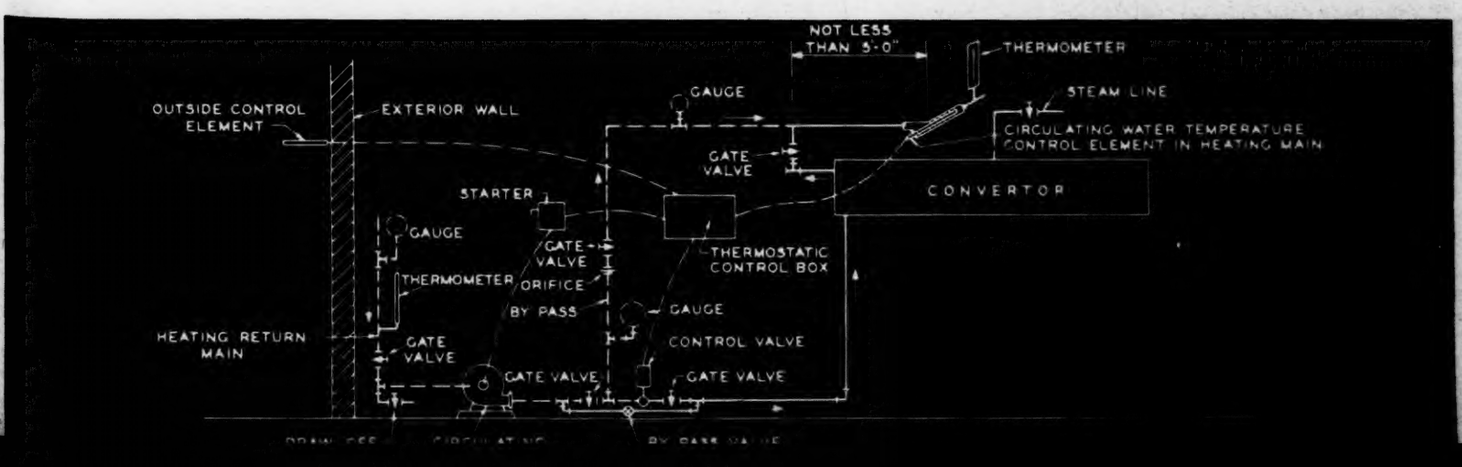
Features of Glenside Homes, a U.S. Housing Authority project sponsored by Reading Housing Authority, include central steam boiler plant serving remote hot water converters from which water is pumped to a unit heater connected to duct system in each dwelling unit.



FLOOR PLANS, right, of typical apartment in Glenside Homes. At the left is a duplex type dwelling occupying two floors. Modine unit heater on first floor supplies, through a duct, heated air to plenum chamber on second floor, from which heated air flows to the bedrooms and bath. At the right is shown first and second floor apartments, each complete on its floor. Modine heaters, one in each apartment, supply heated, cleaned air to individual rooms.

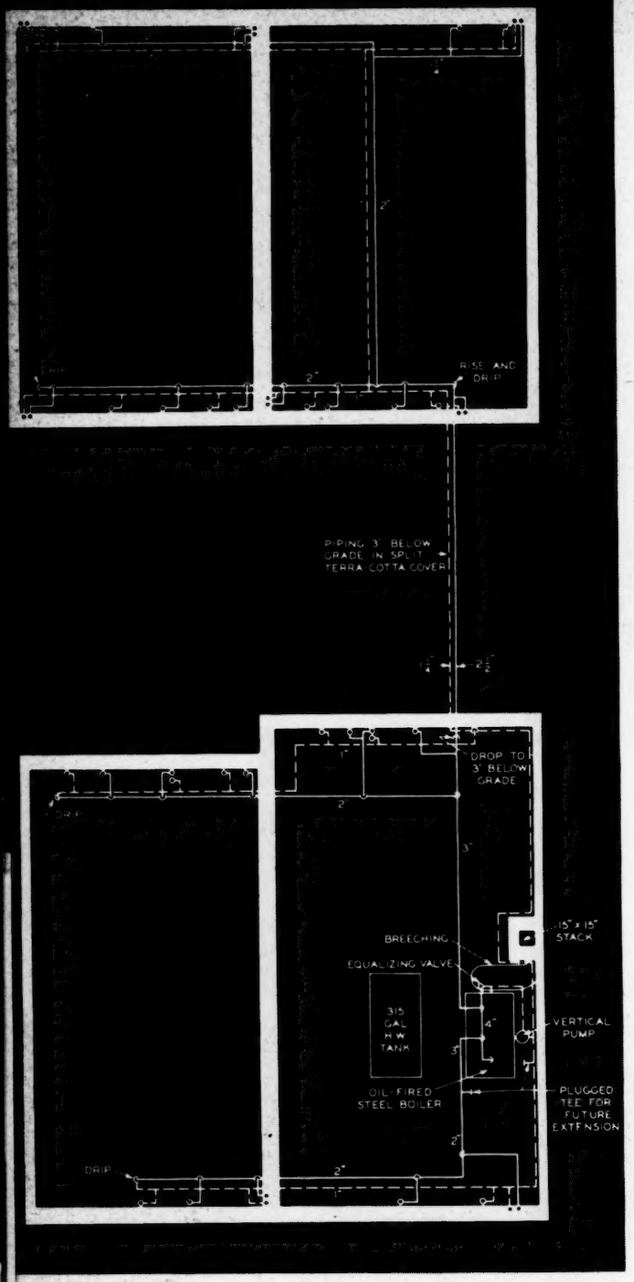
ADMINISTRATION BUILDING, above. Project consists of 46 buildings housing 400 families. Hot water system has continuously operating pumps controlled by outdoor thermostats which vary water temperature in flow main. Unit heaters have 2-speed manual control. Heating contractor was Daniel J. Keating Co.

METHOD OF CONTROL on converter room equipment is illustrated below. Use of steam heating gives high temperatures desirable for service water heating while converting to hot water at distribution points makes possible use of small pipe sizes. Hoffman Economy circulators and controls are used throughout.

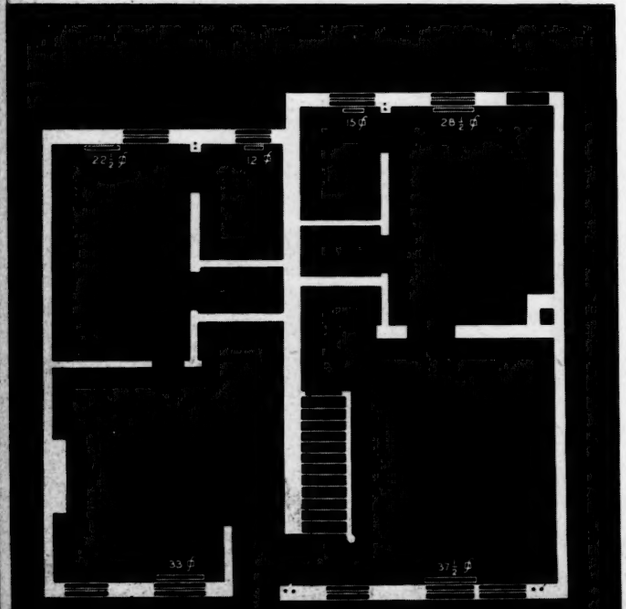


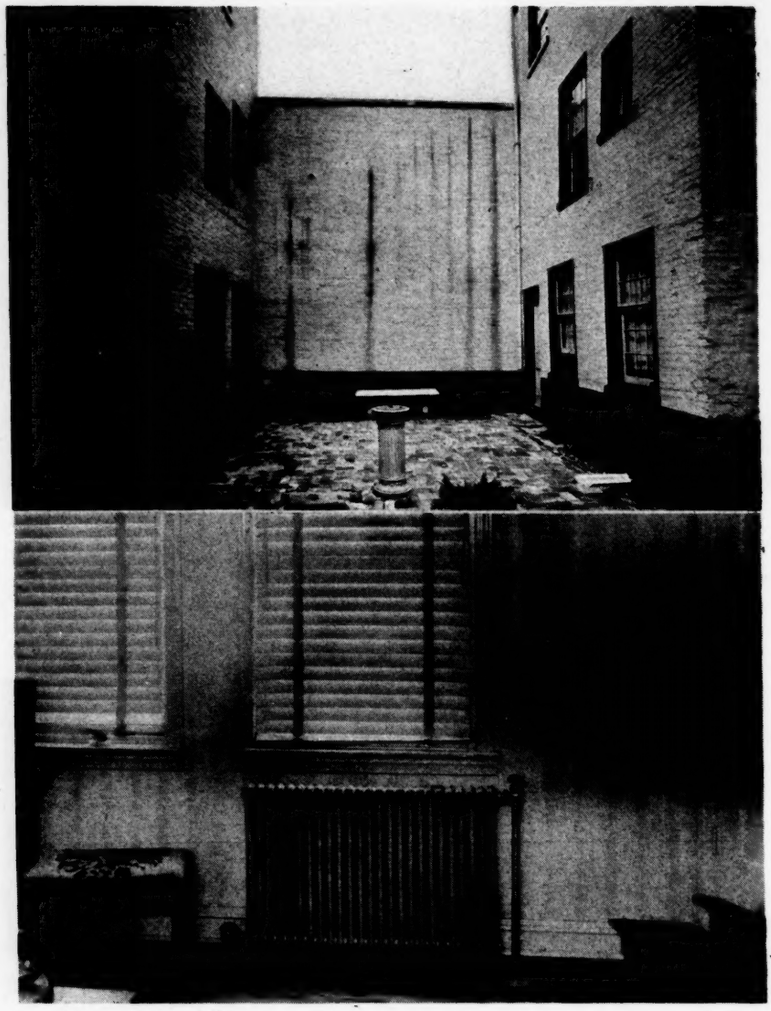
310-12 S. CAMAC ST.

PHILADELPHIA, PA.

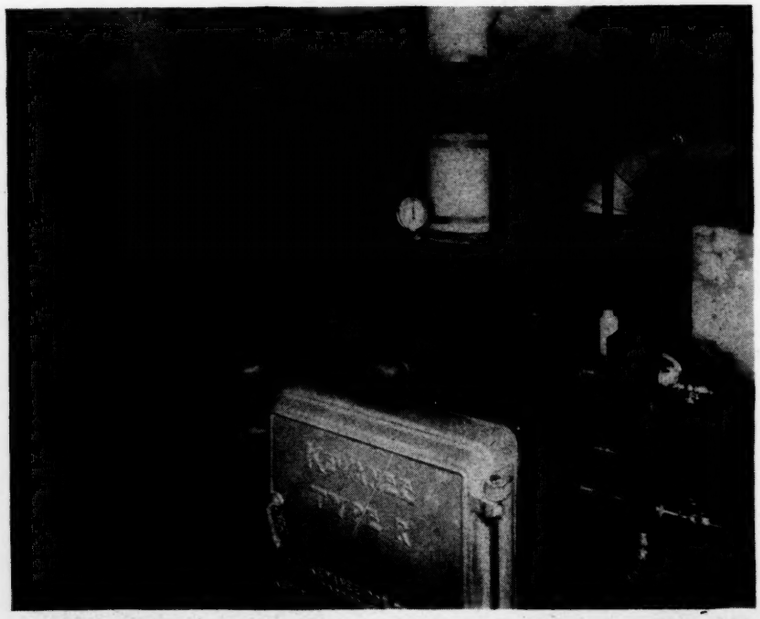


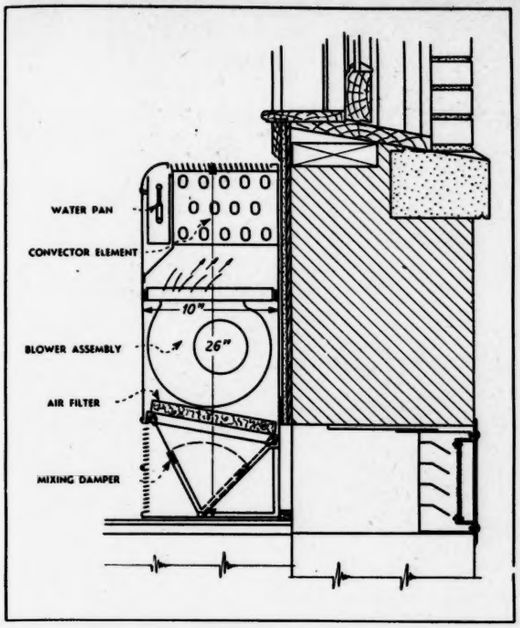
MODERNIZATION was carried out in adjacent small three-story houses converted into apartment houses with six apartments in each house. Heating plant is a Warren Webster vapor system. A boiler in one building supplies steam and hot water to both buildings. Above is plan of basement piping, showing underground pipes. Below, a first floor plan.



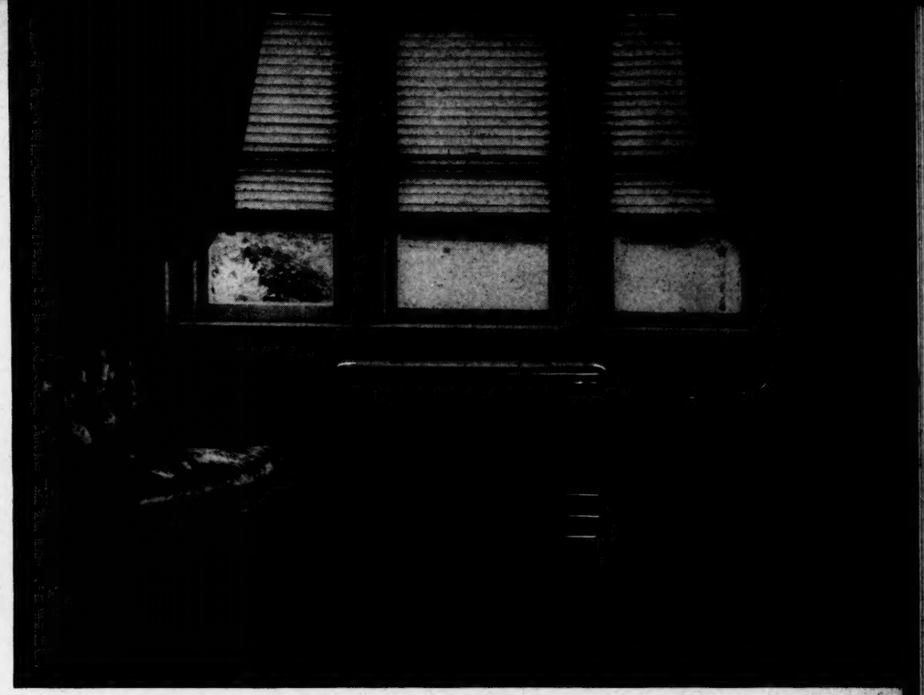


CONDUIT to other house runs under garden shown above. Return grade back by gravity to a Chicago vertical pump in boiler room. Each of the Pierce Butler midget radiators shown has a Webster valve and orifice on the supply and a trap on the return. Drip points have Webster float and thermostatic traps. Below is the 2652 sq. ft. Kewanee boiler with Quiet May oil burner. Latter under direction of Minneapolis-Honeywell controls. Plant carries 37 radiators totaling 1000 square feet.





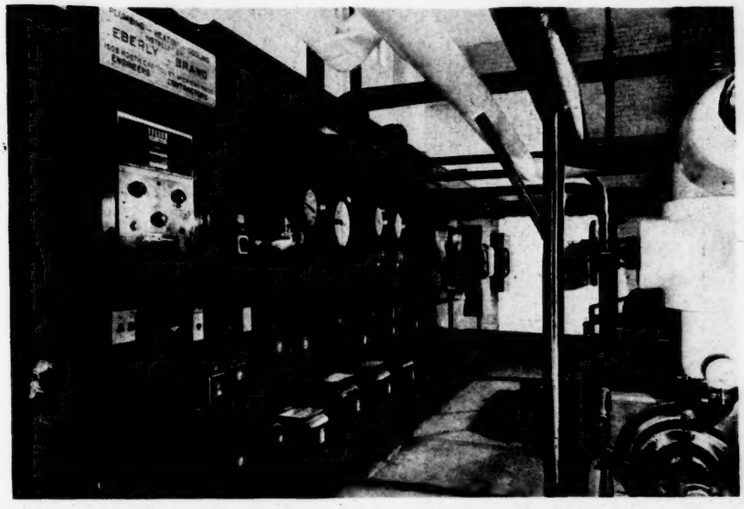
AIR CONDITIONER, cross section, as used in living rooms, dining rooms and bedrooms of 4801 Connecticut Ave. Cold water is circulated through the heating surface in summer, hot water in the winter, through down feed systems. Air conditioners are C. A. Dunham Co. Temperators. Circulating pumps are also Dunham. Kitchens and baths have direct radiators. The heating and air conditioning was designed by George F. Miller, Washington, and installed by Eberly & Brand, Washington, D. C.



LIVING ROOM INTERIOR showing one of the 396 air conditioning units. Dunham controls operate a Dunham proportioning motorized valve in the steam supply to the Patterson-Kelley converter, controlling the temperature of the water to the heating system. Architect, David L. Stern, Washington.

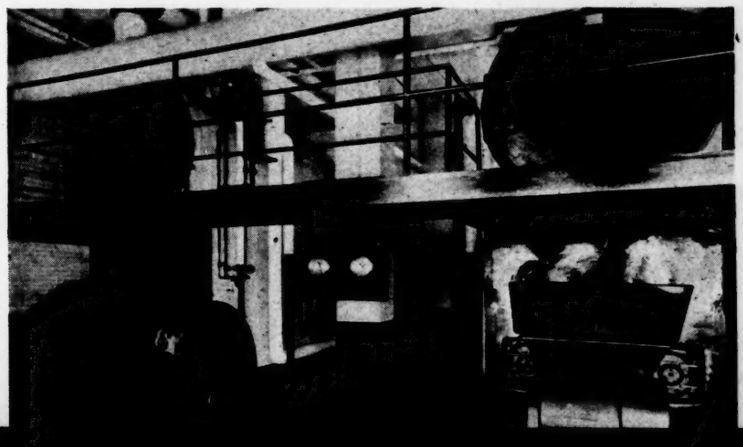
4801 CONNECTICUT AVE.

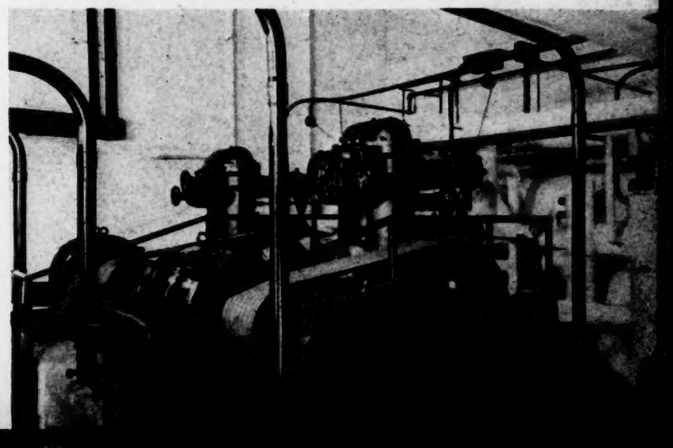
WASHINGTON, D. C.

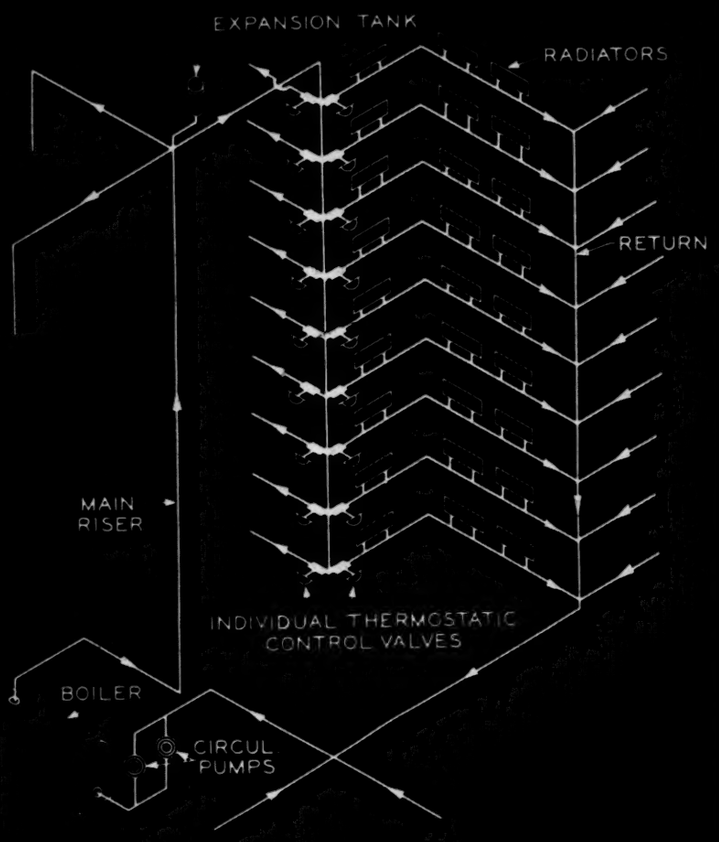


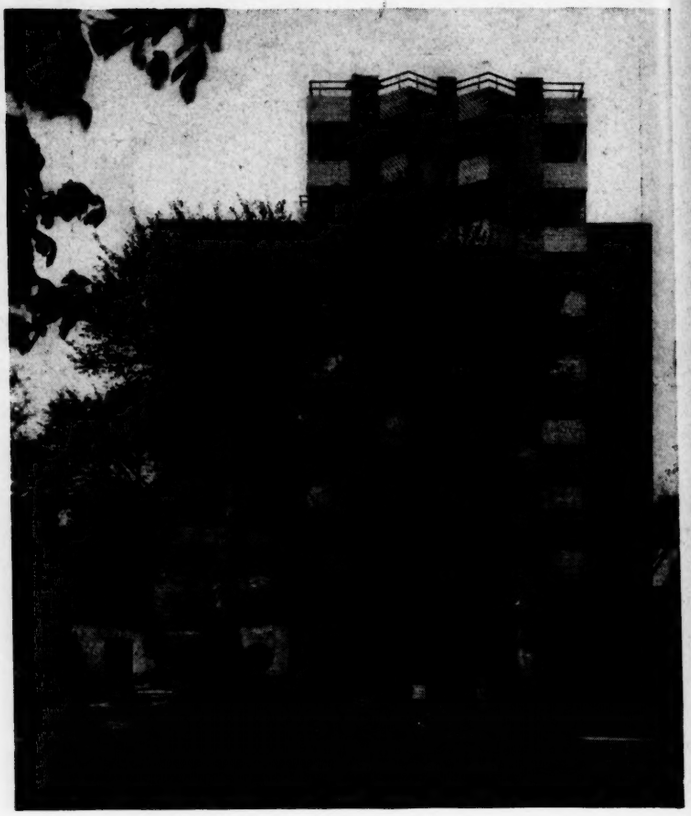
STOKER FIRED BOILERS, below, showing the two Heggie Simplex boilers and Detroit stokers. Above is the instrument panel where the galvanometer takes a reading every twenty seconds from the heat balancer radiator and from the outside temperature control to operate the proportioning valve. Panel includes four-station wet-and-dry bulb indicator. Panel is quite complete, is 30 ft. in length.

EXTERIOR OF 4801 CONNECTICUT AVENUE, above. Below is illustrated the York compressors, which have a capacity of 130 tons. York shell and tube water cooler and evaporative condensers comprise cooling plant which chills water in the converter. Cool water is then pumped to room units through separate summer piping.









1609 N. PROSPECT AVE.

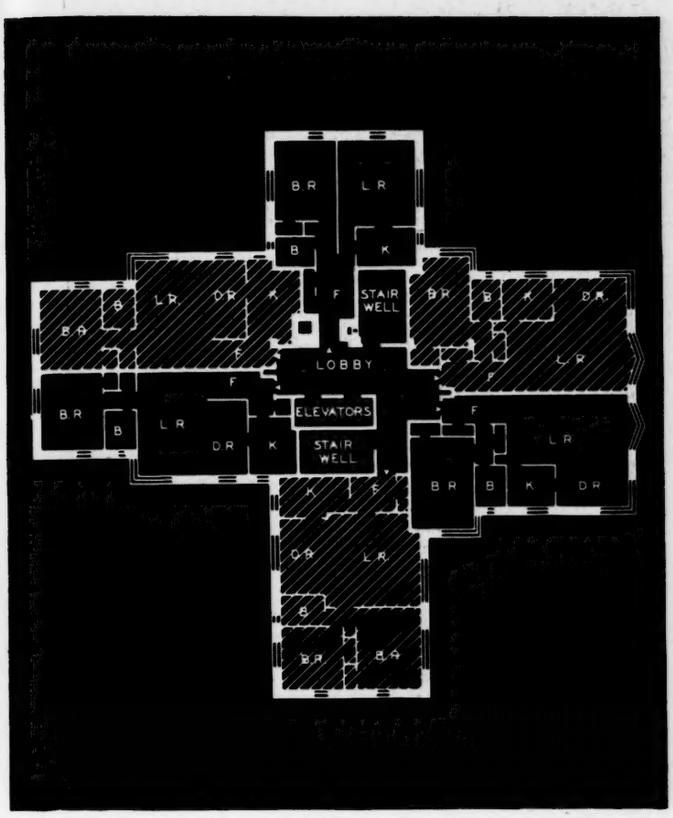
MILWAUKEE, WIS.

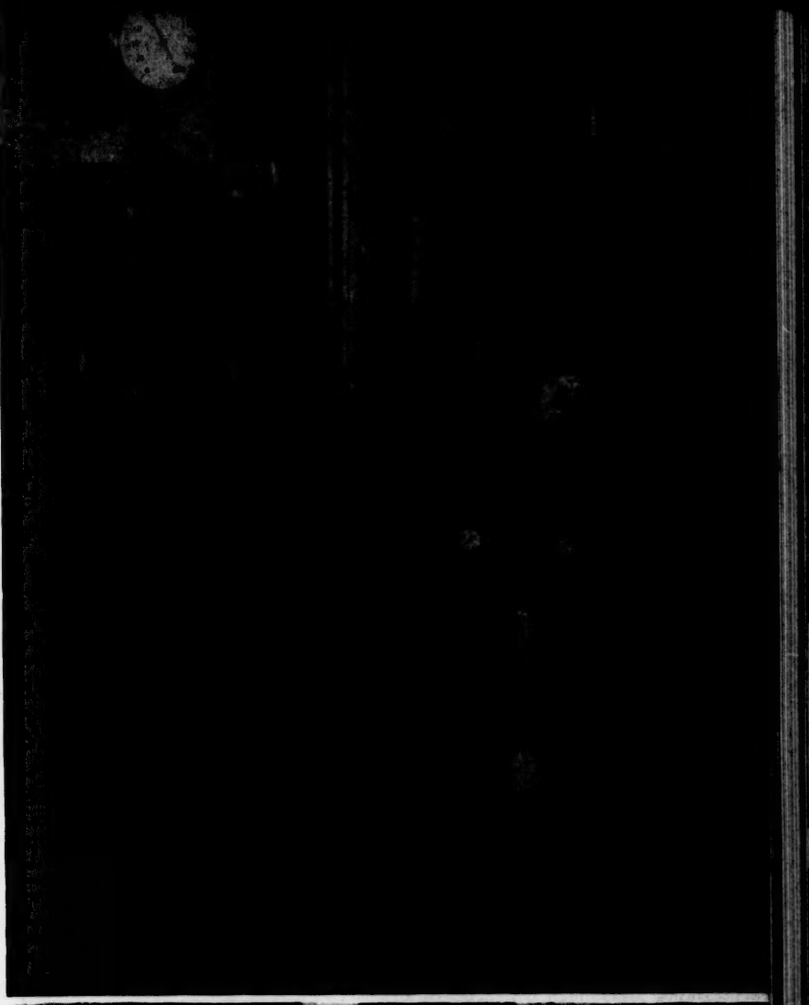
FORCED HOT WATER heats the nine-story apartment at 1609 North Prospect Ave., Milwaukee, above, which contains 55 suites. Building was designed by Russel Barr Williamson, architect; engineers were Boynton & Johnson; heating contractor was Pflugradt—General Electric Air Conditioning Co.; general contractors, East Side Construction Co., Milwaukee.

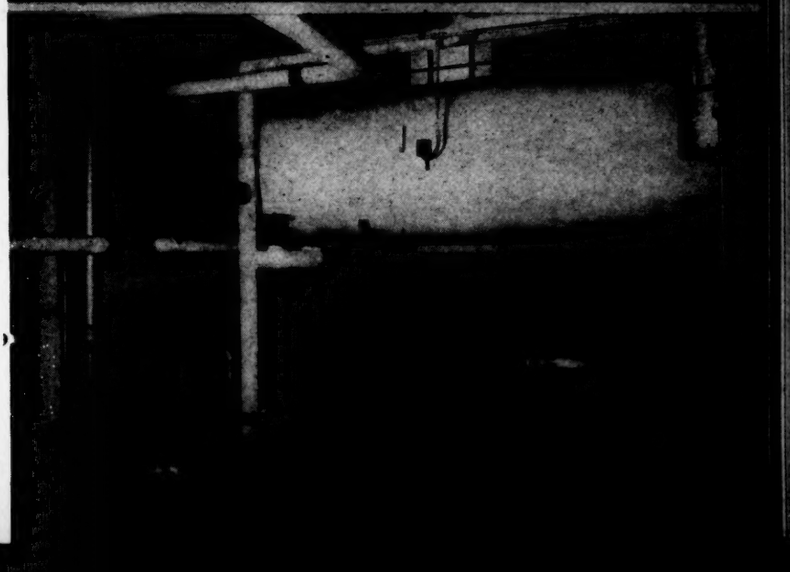
SCHEMATIC DIAGRAM of heating system is shown at the upper left. Circulation is by positive-pressure centrifugal pumps running continuously except in mild weather when they are controlled by a Minneapolis-Honeywell adjustable interval electric timing clock. Total frictional resistance of piping is 11 ft. hydrostatic head. Pumps develop fifteen foot head.

HEAVY EXPOSURE, due to large window space (left), and building's situation along the lake, causes heavy demand on heating plant. Supply and return mains are large so as to reduce friction and thus reduce pump power consumption.

TYPICAL CONVECTOR by Trane, in living room, below, left. All convectors in a suite are controlled by the thermostat in the living room. Bedroom convectors are equipped with dampers to provide means for reducing heat output at night.







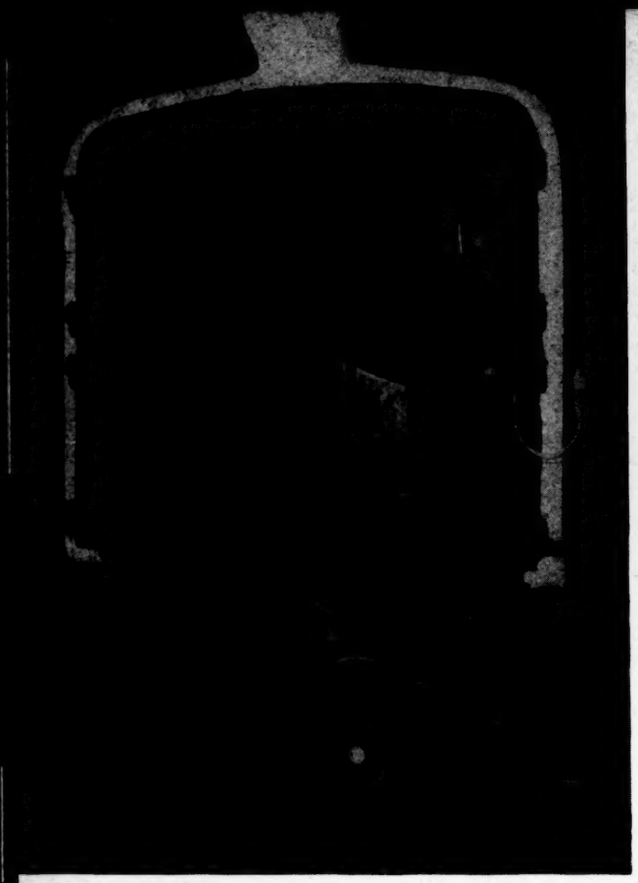
Features of this apartment include a forced hot water system with a branch circuit for each apartment and with a complete temperature control system. A pneumatic temperature control valve operated by a room thermostat controls the water supply to each circuit with the centrifugal circulating pumps running continuously except in mild weather, and a bin feed stoker.

FLOOR PLAN is shown above. Note that each apartment has at least two and in some cases three exposures. As shown on schematic diagram the supply risers are downfeed and branch circuits are run horizontally at the base of outside walls.

AIR COMPRESSOR, shown in the upper right photo, for the Minneapolis-Honeywell pneumatic control system. Each branch circuit in the hot water piping carries the radiation for one apartment and is controlled by a pneumatic temperature control valve on the supply end of the circuit actuated by a room thermostat with balancing cock on return end of each circuit.

BIN FEED STOKER by Iron Fireman, is shown at the right, above. The boiler plant consists of a Kewanee steel plate boiler designed for 50 lb. working pressure. Boiler has a rating of 8500 sq. ft. E.D.R. Total radiator surface, 7300 sq. ft. E.D.R.

DOMESTIC HOT WATER is heated by forced circulation through a heat exchanger, shown at the right, rated at 700 gallons per hour, and stored in a 1200 gallon tank. Heating system is simple and showed good operating characteristics this spring. No operating data available at the time of going to press.

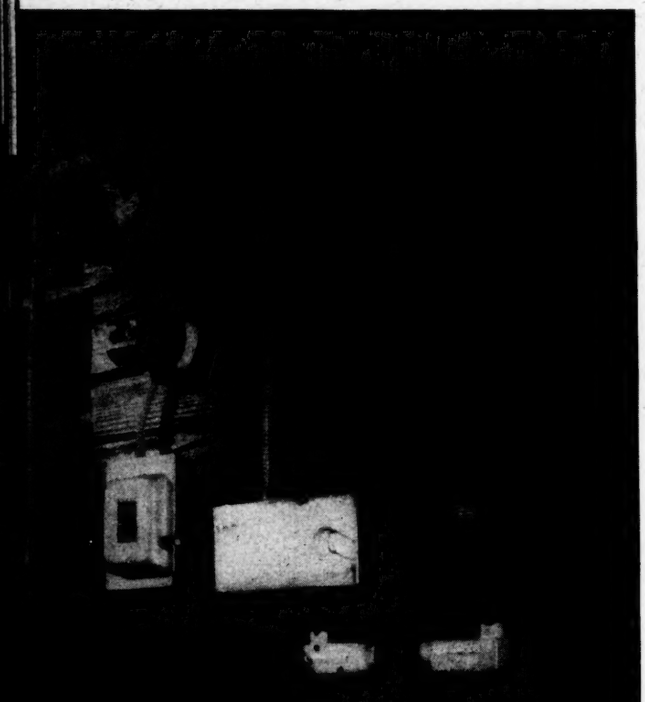


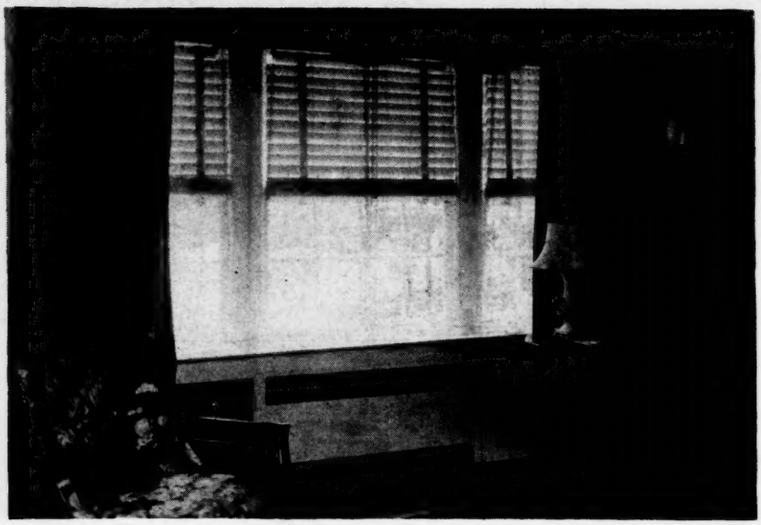
FOUR HEATING PLANTS, each with a single H. B. Smith cast iron boiler and Petro oil burners, as shown above, serve English Village. The ten buildings contain one hundred apartments.

ENGLISH VILLAGE

CRANFORD, N. J.

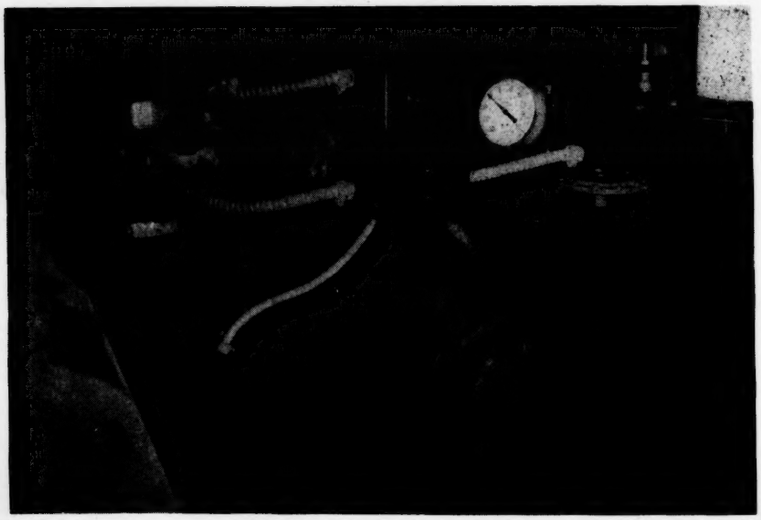
CONTROL PANEL for each of the heating plants includes a Protectorelay, lower right, and an Au-Temp-Co three point control panel, upper right. Latter controls burner from temperature outside, in room, and from radiator output.

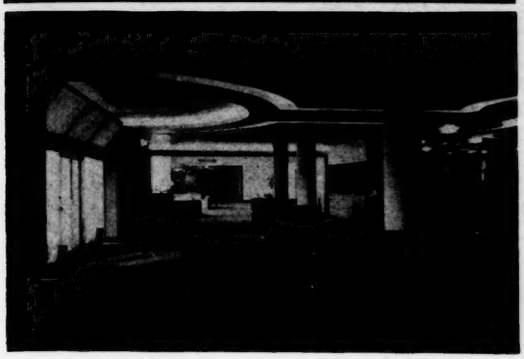




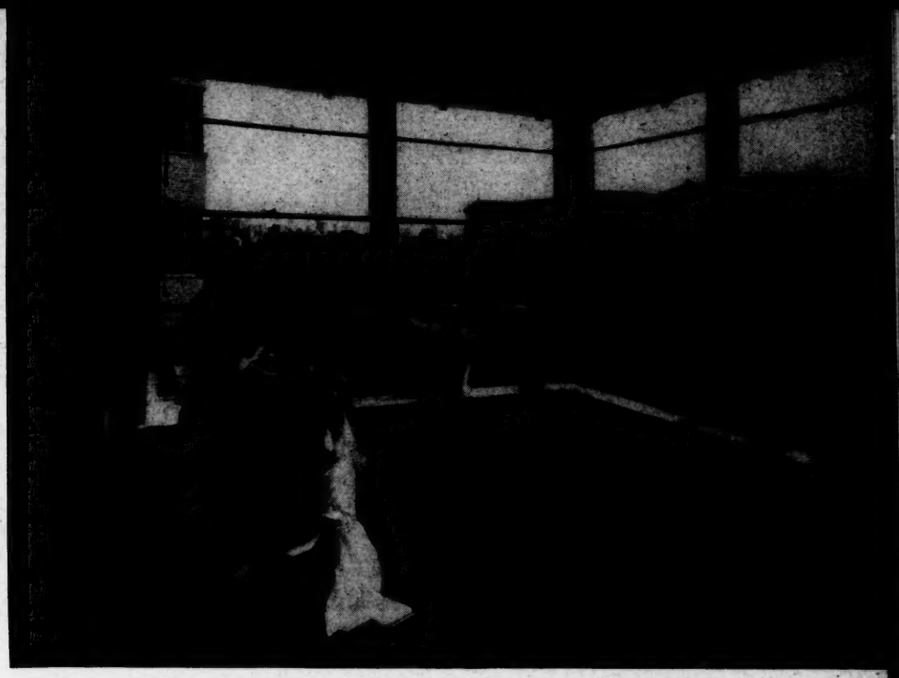
LIVING ROOM in an English Village apartment showing one of the 545 Trane convectors totaling 17,000 sq. ft. of equivalent radiation. Below, is shown the layout of the project, which covers between 3 and 4 acres. Garages are provided in the basement and accessible from the outside of a quadrangle formed by the building. F. Hollingsworth, New York, was the architect, Mortimer Foster, consultant, while the heating plants were installed by Westfield Engineering Co., Westfield, N. J. Apartments range from three to five and a half rooms each —the latter with two baths, and rents from $65 to $112 per month.

VACUUM PUMP, by Sterling Engineering Company, is shown in its location immediately back of the boiler illustrated in the upper left. The heating system is of the down-feed vacuum type. System operation is regulated by burner operation under direction of 3-point controller located at a radiator selected to give the desired result. In case of sudden outside temperature drop, burner responds to this but is then held in check by radiator temperature bulb and room temperature so as not to overheat. Control can also be set for manual operation.





2601 PARKWAY with 506 apartments in Philadelphia's largest and most luxurious apartment built in recent years. Above is the structure, below a view of the lobby, heated by unit heaters.

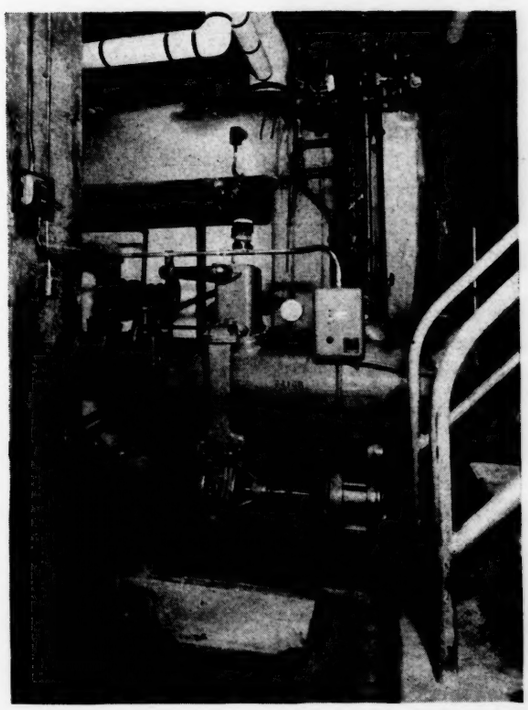


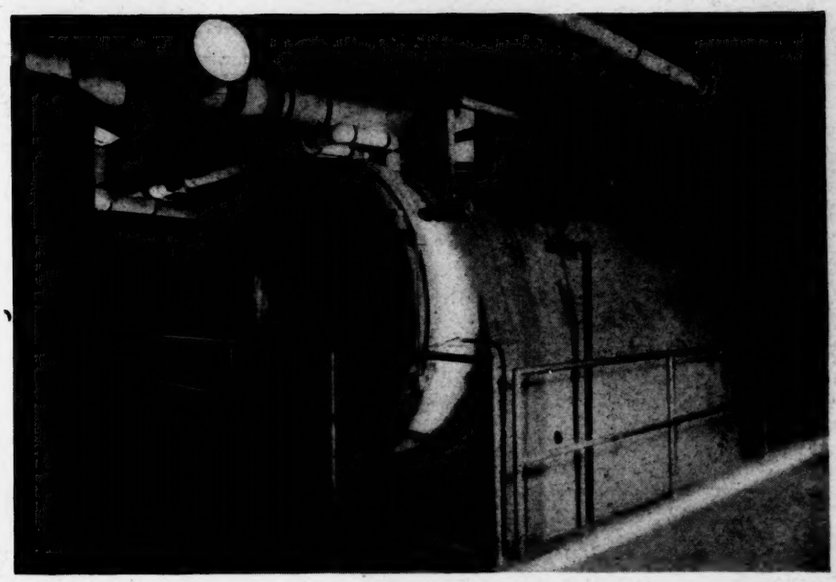
CORNER ROOM, 2601 Parkway, showing typical U. S. convector. System is an upfeed vacuum, with inside baths on separate riser manually controlled. Convectors have Webster valves and traps. Aaron Colish, Philadelphia, was the architect, and the heating contractor, Woolston-Woods Co., Philadelphia.

PUMP ROOM, below, showing the Nash vapor turbine vacuum heating pump which serves 1750 convectors. Minneapolis-Honeywell Weatherstats control the valves serving the various zones.

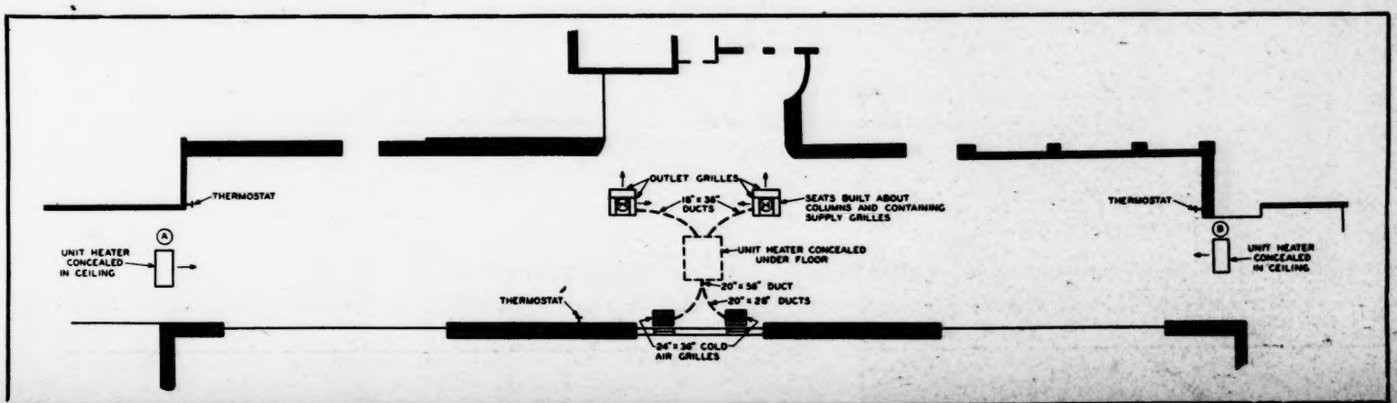
2601 PARKWAY

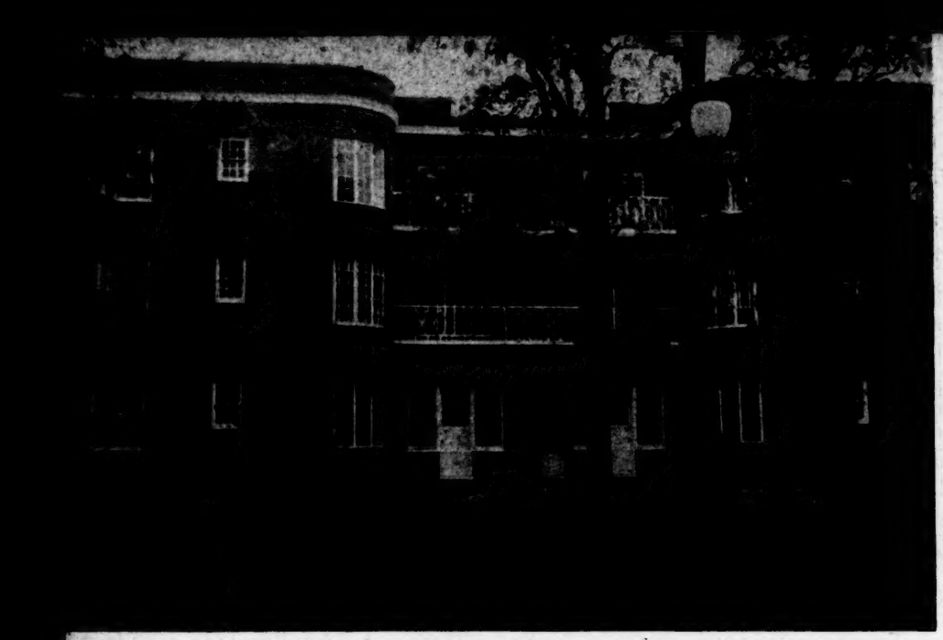
PHILADELPHIA, PA.





LOBBY PLAN, below. At each end a Webster-Nesbitt unit heater is concealed in ceiling with the grille facing the lobby. Center of lobby space is heated by a Webster-Nesbitt unit heater under floor drawing cold air from floor. Heated air is supplied through grilles in window seats. Project heated by Pacific steel boiler fired by Enterprise oil burner, above.

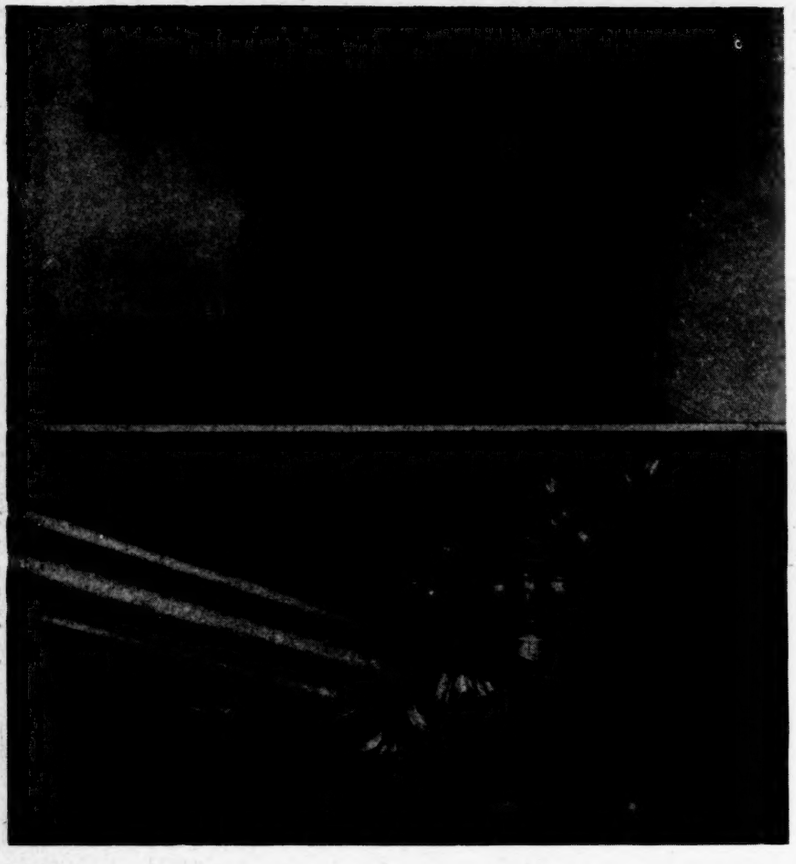




RUSSELL HOUSE, N.

RUSSELL GARDENS, L. I.

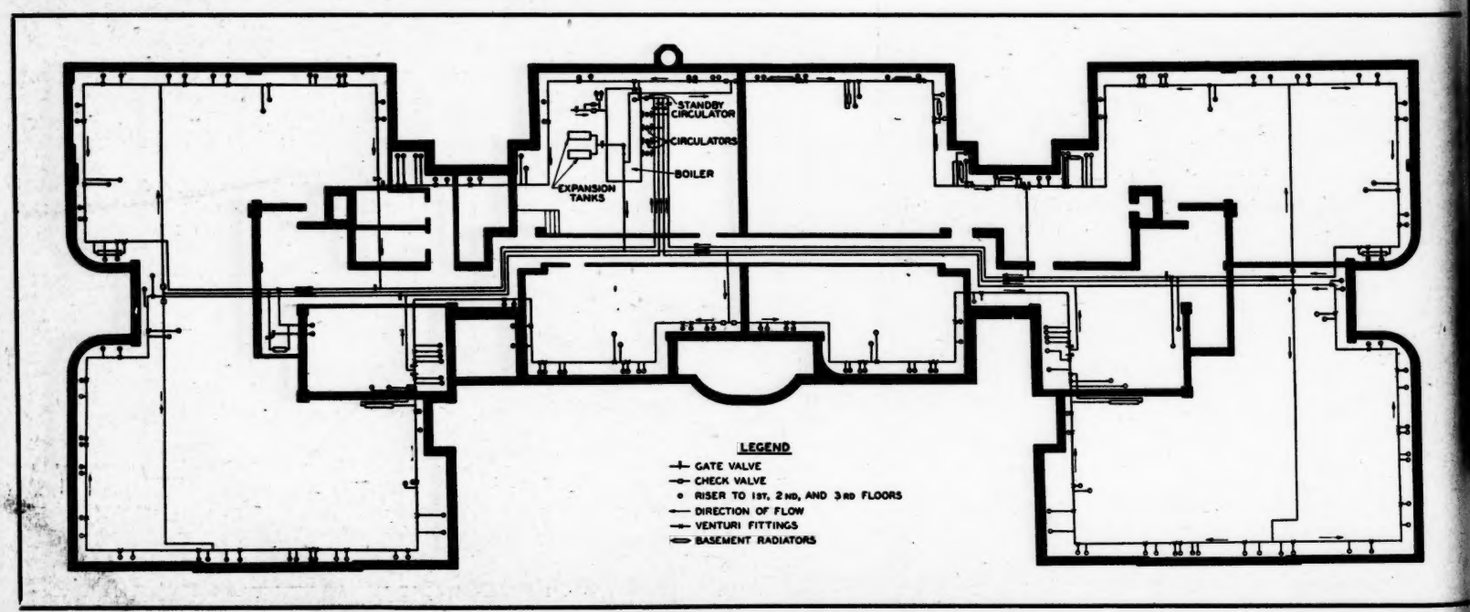
FORTY-FIVE suites are included in the Russell House, of which Manoug Exerjian, New York, was the architect, Lakeville Plumbing Co., Inc., Floral Park, the heating contractor. Project completed late this spring.



CONVECTORS, of the cast-iron type, made by National Radiator Corp., are used throughout the project. At left is one of these convectors in curved living room wall.

CHECK VALVES, left, in the hot water system piping. These Taco valves are adjustable and permit the independent operation of each zone. See plan drawing, below.

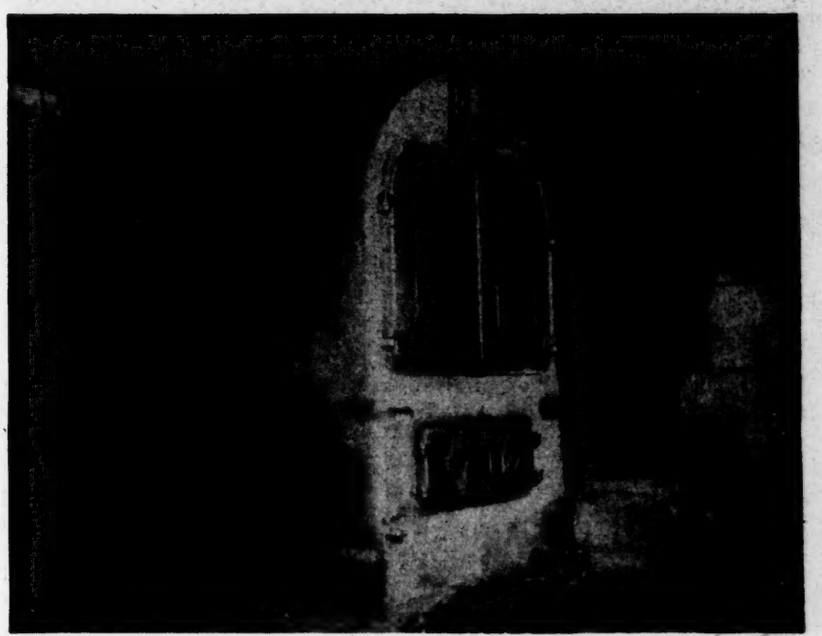
BASEMENT PLAN, below, showing the arrangement of piping for the Taco one pipe hot water heating system. The building is divided into four separate zones.



A one-pipe forced hot water system, cast-iron convectors, and outside temperature bulb control have been successfully applied in the suburban apartment development described on these pages.

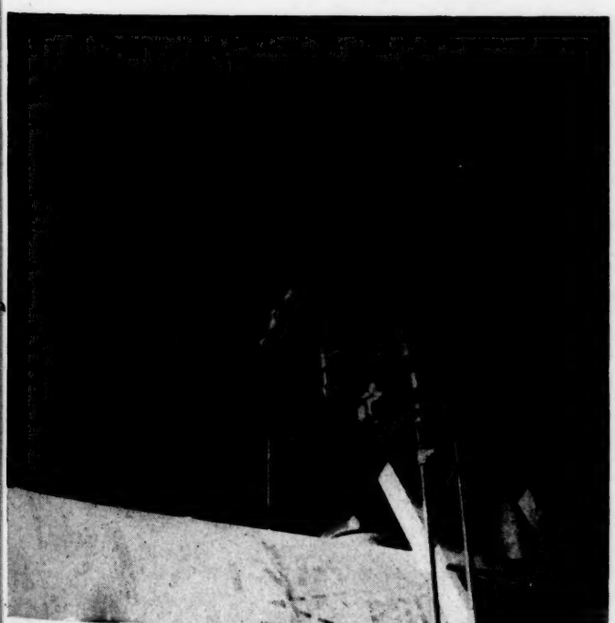
FIVE CIRCULATORS are shown to the right, one for each zone and one for standby. Cutting in the standby involves only adjusting valves and plugging in or out the wiring to the two point control system for each zone.

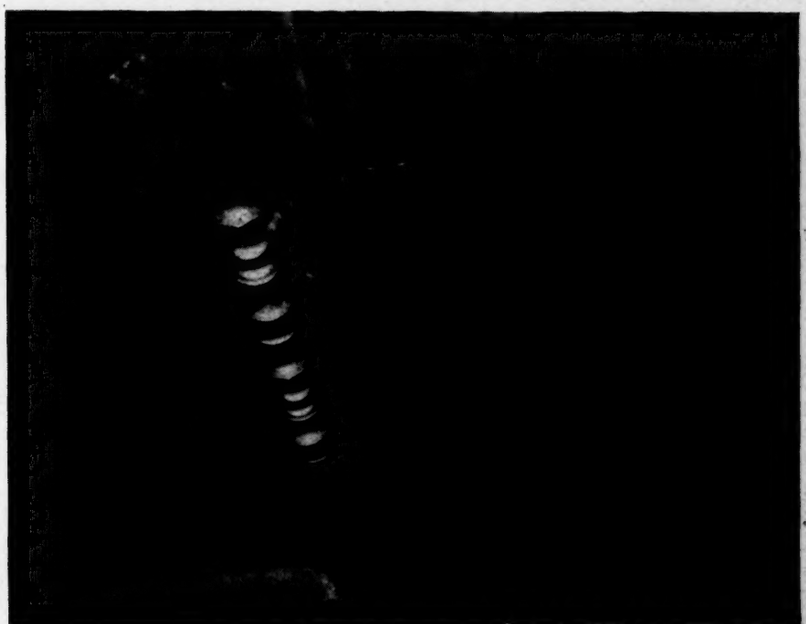
BOILER is by National and fired by a Gilbert & Barker oil burner burning No. 6 oil. Burner on-and-off controlled by Minneapolis-Honeywell Aquastat in the boiler.

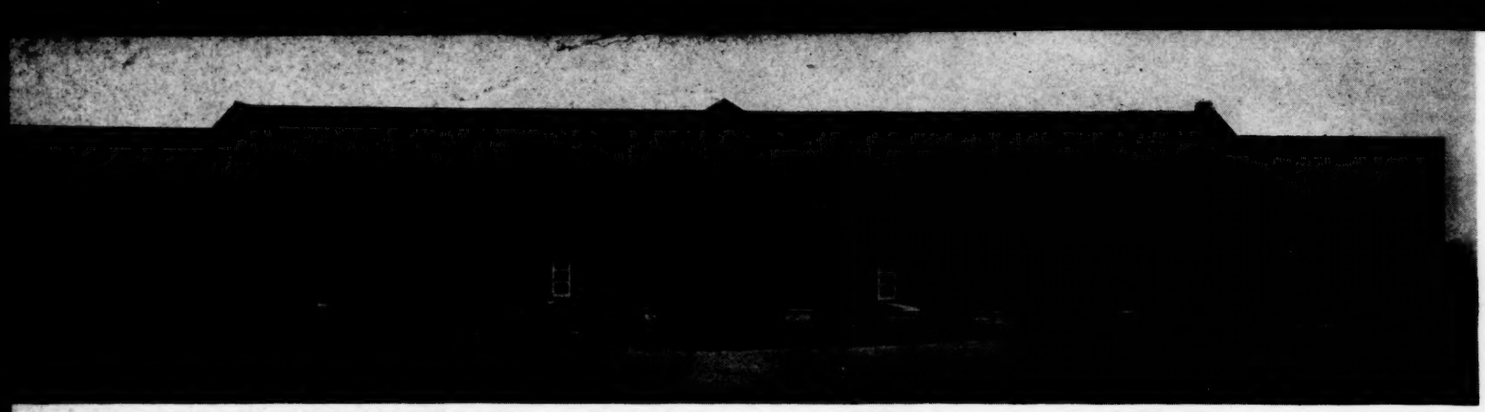


EXPANSION TANKS are illustrated in view below. An Au-Temp-Co control, actuated by the zone water temperature and outside temperature, determines the on-or-off operation of each of the four hot water circulators.

BRANCHES TO RISERS are of copper piping, as shown in photo at lower right. Taco Venturi fittings, shown in main, are used at each point where return riser connects with main as shown in photograph below.





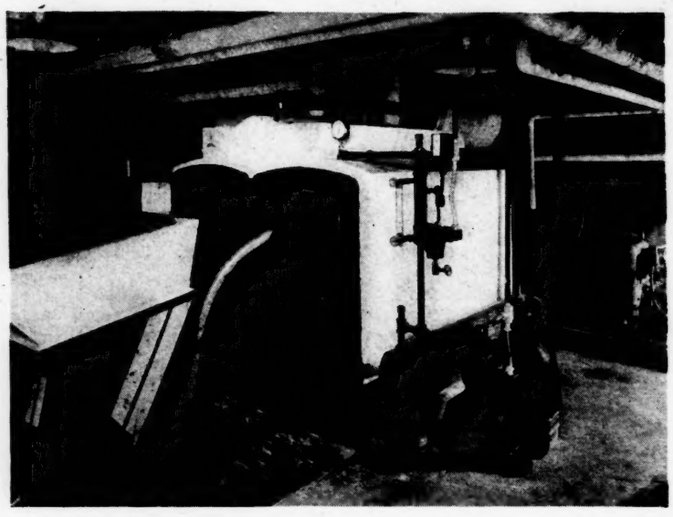


MARCY VILLAGE

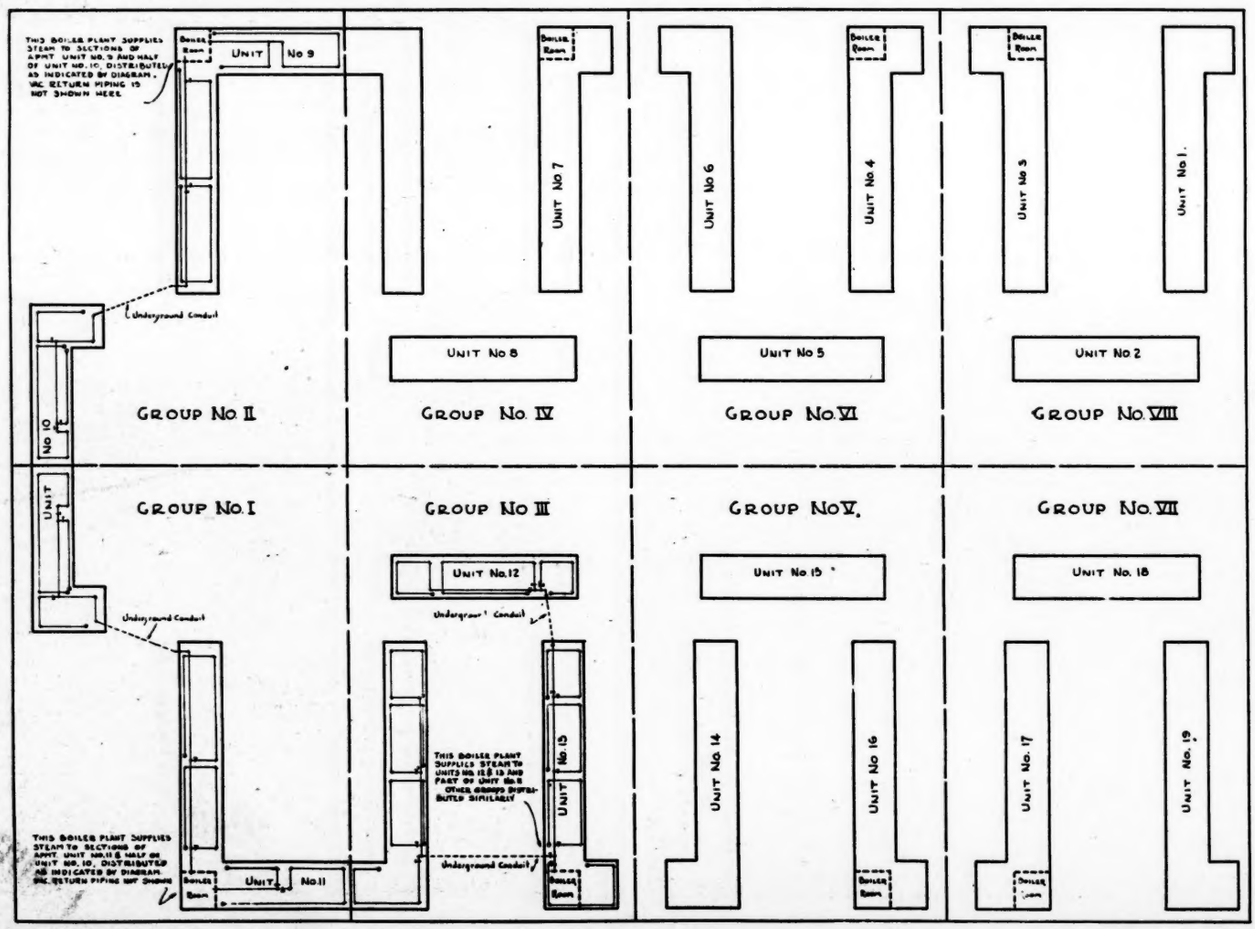
INDIANAPOLIS, IND.

UNIT 10, front view, of Marcy Village, above. Project consists of 19 apartment buildings, 5 storerooms and 16 garages, with 277 dwelling units from 3-5 rooms each. Below, one of the 8 boiler rooms with Frank Prox cast-iron boilers and Holcomb & Hoke stokers. The Nash vacuum pump, one of eight, is shown at rear right. Project included 1742 radiators.

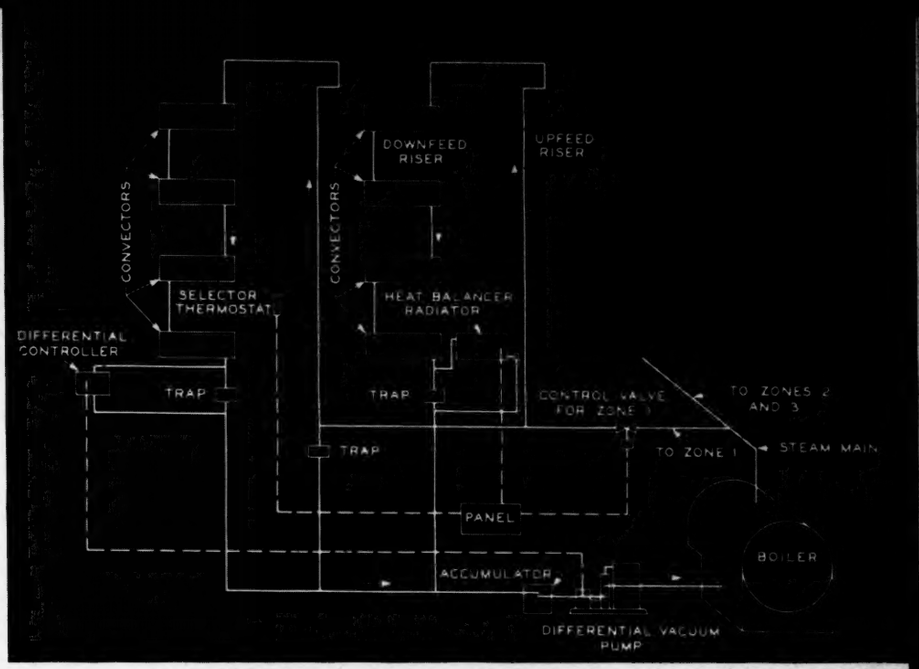
EFFICIENCY KITCHEN, showing one of the U. S. Thin-Tube cast-iron radiators used throughout, equipped with Webster valves and traps. Heating is by vacuum steam. Steel convectors were used in public spaces. Charles R. Ammerman, Indianapolis consulting engineer, was the heating engineer.



PLAN OF STEAM MAINS is illustrated in the plot plan below. Multiple-branch mains are arranged so that sections of the buildings may be shut off as desired. Split type vitrified tile conduits are used as shown to house the piping underground where necessary. Project involved 14 miles of pipe.

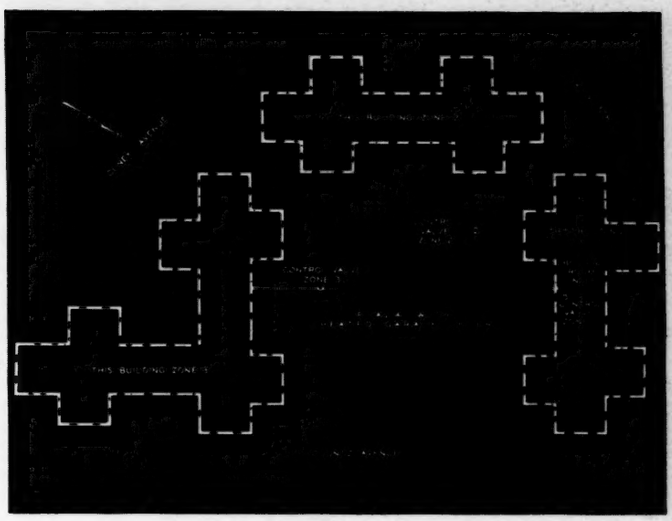


OGONTZ MANOR
PHILADELPHIA, PA.



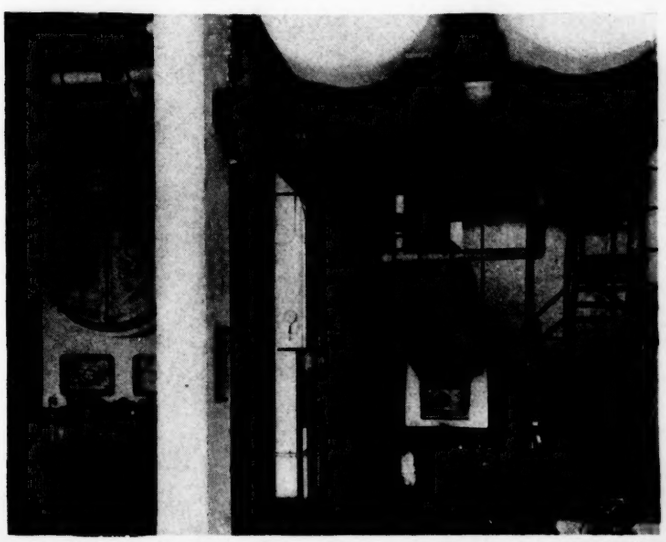
METRO METHOD of piping with Dunham Differential heating schematically illustrated at right, is used in Ogontz Manor. Vacuum and steam quantity in each zone is determined by position of control valve under direction of selector thermostat and heat balancer in each zone. Steam in concealed downfeed riser passes through Arco Metro convectors with no valves, and no traps except at bottom of each riser. A Dunham Differential controller governs performance of vacuum pump to maintain continuous circulation.

THREE BUILDINGS constitute Ogontz Manor and each is a separate zone for heating. Space between the buildings is landscaped and forms a plaza, underneath which is garage heated by Grinnell unit heaters. George S. Idell was the architect.

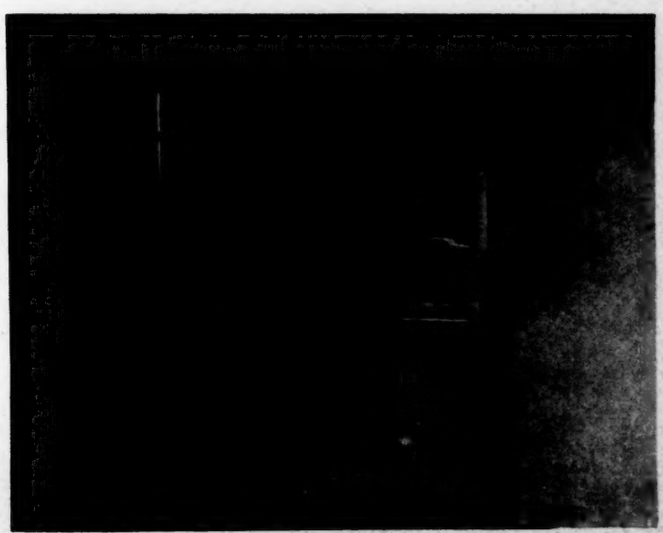


PLOT PLAN showing relative location of three buildings and boiler room. Garage under the landscaped plaza is made possible by the difference in street levels, Ogontz Ave. being quite low. Project has 203 apartments of from 2-4 rooms each.

OIL FIRED Pacific steel boilers, below, are fired with Clark National oil burners. Larger boiler is for heating, smaller for hot water. Stack exterior is square in section with circular interior; space between is used as a vent for the boiler room.

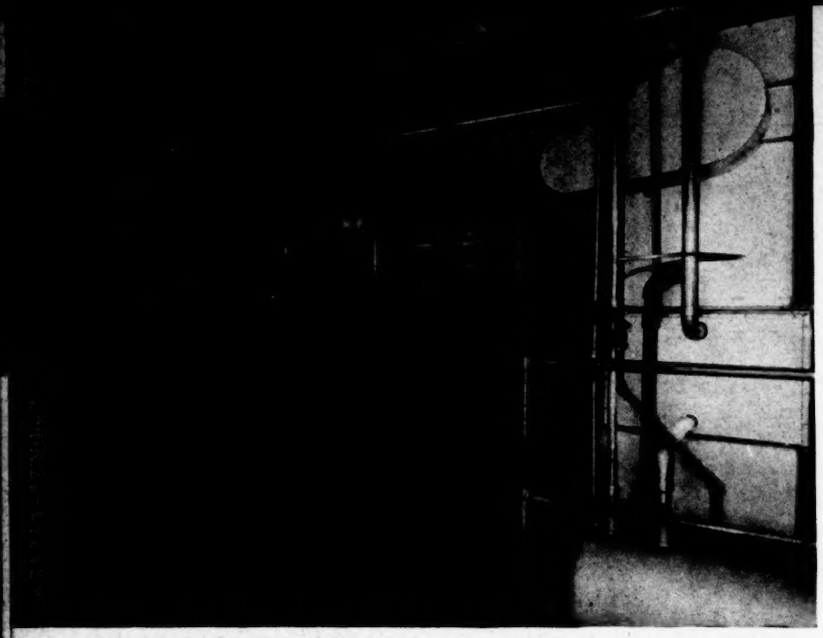


CONCEALED CONVECTOR extends slightly beyond window to accommodate risers. Dunham differential vacuum pump is under direction of one differential controller on farthest riser. One Dunham trap is used on bottom of the concealed risers.



COOLED APARTMENTS

ST. LOUIS, MO.



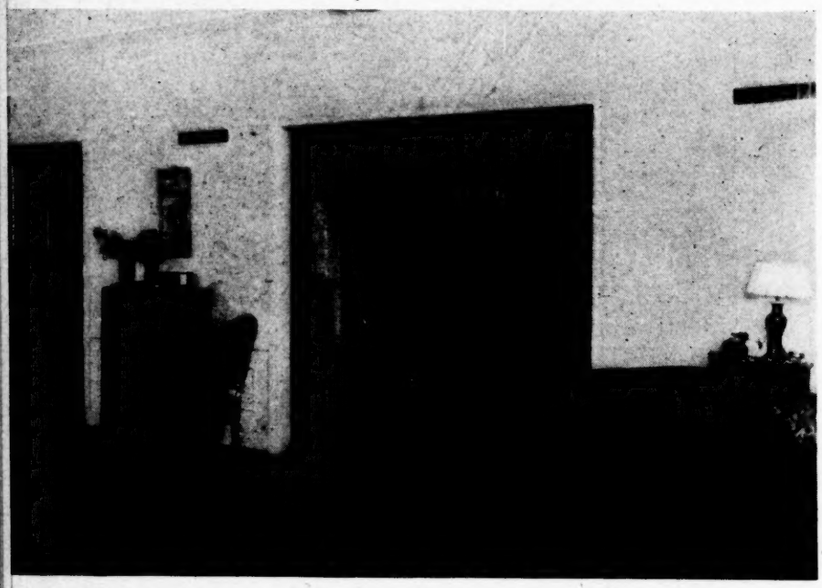
COOLING EQUIPMENT, in the basement of one apartment house, above, includes Curtis condensing unit, shell-and-tube water coolers and evaporative condenser. A conditioning unit, one per apartment, has extended surface coils for heating and cooling, fan, filter, humidifier and motor. Cooling capacity is from 2-3 tons per apartment.

ST. LOUIS leads the country in number of air conditioned apartments. Prominent among these conditioned apartments are eight cooled by the methods here described.

These apartments range in size from 6 to 15 families each and in cooling capacity between two and three tons per apartment. Mechanical condensing units are employed to chill water which is circulated to air conditioning units placed in various locations. For winter the circulating system is connected to an oil or gas fired hot water boiler, the changeover being accomplished by hand-operated valves. The control of the air conditioning unit in each apartment consists of a thermostat, a motor operated valve (either controlling a water by pass around the coil or throttling the flow of water to the coil), summer-winter switch, humidistat and solenoid water valve in the humidifier line.

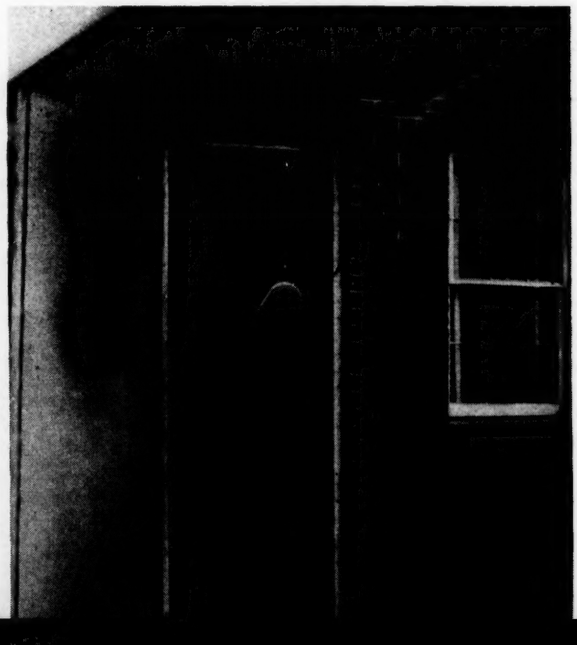
The water cooling equipment in the basement operates as a flooded Freon system, and includes the necessary float switches, oil separator, heat exchanger and safety devices, as recommended by the compressor manufacturer.

The water pumps run continuously, and are hand started. The compressor is controlled by the temperature of the water leaving the cooler, by means of a thermostat in the cold water line. The electrical connections are so arranged that the evaporative condenser starts when the compressor starts. As a protection against freezing the cooler, in case the low pressure cutout should fail, the system is wired so that the compressor will stop in case the water circulating pump should stop for any reason. However it is possible to operate any part of the refrigeration manually, if necessary.



ADJUSTABLE SUPPLY GRILLES, above, are provided in each apartment connected to low velocity supply ducts. Recirculated air is usually through a hallway but sometimes return ducts are used. Outside air dampers are not easily accessible, to discourage tampering by tenants. Above is shown typical living room; below, one of the mechanically cooled apartments—one of eight so conditioned in St. Louis. Cooling water enters coil at 45F, leaves at 53F. Hot water enters at 150F to 250F in winter, furnished by oil or gas boilers.

AIR CONDITIONING UNIT, by Trane, in one instance is located on the service porch as shown below. In some apartments these or similar units are located in closets designed for that purpose. In others, units are in furred spaces over the hallway while in one case a central unit is located in the basement with individual ducts to each apartment. All 8 apartments cooled by Curtis condensing units.



CROSS-SECTION

APARTMENT PRACTICE

THE 15 apartment house projects described on the preceding pages were selected because they represented what judgment seemed to indicate was a good cross section of current practice. The selection was made from over a hundred such projects proposed by many different people—some of them well acquainted with representative practice in a limited area, others with a knowledge of outstanding installations throughout the country—to all of whom the editors are indebted for their help.

Trends

In connection with this presentation, numerous field trips were made and a great deal of investigational work was done which is not evident in the presentation itself. This investigation left the editors with a number of impressions, some clear cut and others not so definite. These impressions may be of interest to others since a number of trends were, seemingly, apparent. No claim is made that these trends are necessarily nationwide or that they are sweeping in scope; rather they should be interpreted as tentative conclusions of the staff which spent a fair amount of time in studying the apartment house situation.

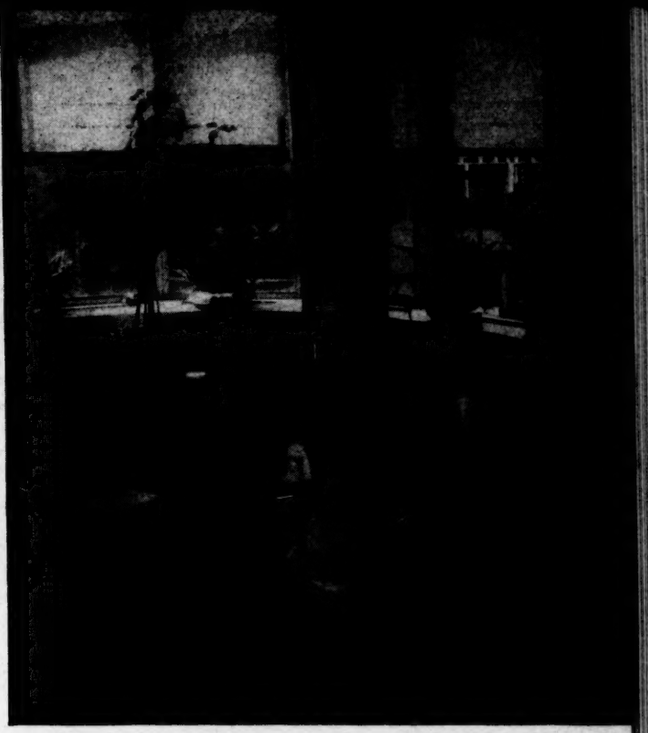
Among these impressions were the following: (1) That apartment house air conditioning (cooling) is, for the time being, going ahead very slowly. The reason for this may be that building owners are watching installations which have been made and making no commitments at present until facts on additional experience with those already made are available; (2) A surprising number of forced hot water installations were noted this year and the impression was gained that the percentage of these of the total has increased over a year ago. Whether this apparent gain in hot water heating has been made at the expense of one-pipe steam jobs or at the expense of vapor and vacuum installations is not known; (3) Use of the apartment house unit heater seems to be growing and it is gathered that this type of equipment may be used oftener in the future than now is the case; and (4) Use of an outside temperature control seems to be finding wide application in apartment house buildings, even in many of the lower cost jobs.

Summer Cooling

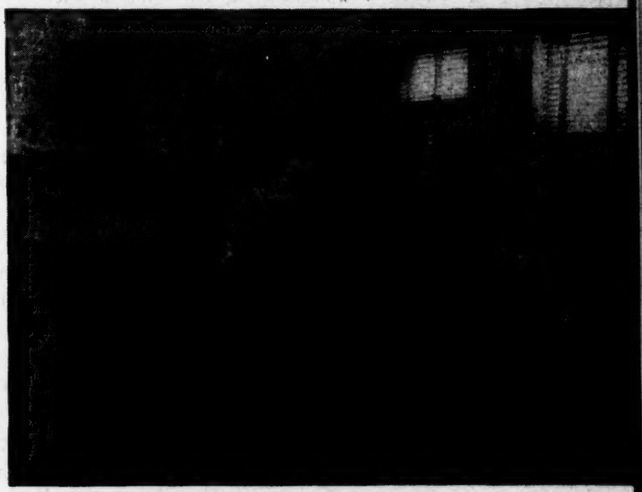
Summer air conditioning (cooling) in apartment houses during the past year and during the first part of 1940, apparently proceeded slowly. No complete data are available as to the number of room cooling units applied in apartments during 1940, but figures prior to 1940 are available on the central systems through the Edison Electric Institute. The figures, summarized in the accompanying table, cover air conditioning plants installed by the owner and do not purport to include isolated room units. The figures in the table are excerpts from a report of 183 utility companies which submitted data to Edison Electric Institute.

Accessory Equipment

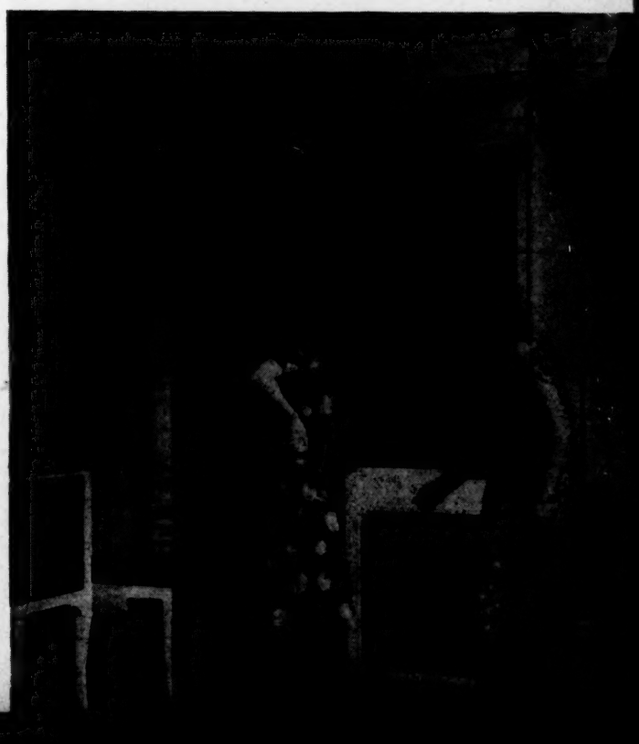
In addition to the isolated room cooler, there are at least three other types of equipment independent of the usual heating or ventilating system but which greatly add to the comfort of the occupants. First, there is the attic fan which finds its primary market in residences, but also has applications in apartment buildings. In cases where an attic fan is used in an apartment building it is often housed in a penthouse on the roof. The accompanying



MODERN ARCHITECTURE often raises unusual mechanical equipment problems. Here is one of many special Arco convectors curved to suit living room windows in Rockefeller apartments, New York.



ROOM UNITS. Above, a Silentaire unit ventilator circulates clean air in a living room, keeps out noise as well. Below, an American Blower Ventura portable conditioner for ventilation and cooling.



ATTIC FANS of IIg make are used to cool this Washington apartment. Stale air is forced out and cool air is drawn in at night. The fan does not normally operate in the daytime.

illustration shows an apartment building in Washington which is cooled by night air, using attic fans.

Second is the portable apartment conditioner, shown in another accompanying illustration, which can be plugged into any electric outlet. The device is essentially a fan arranged in convenient form so that it can be rolled along the floor and placed in a doorway so as to exhaust the hot humid air from the room in use at the time.

Third is a device which finds fairly frequent application in apartments—the window ventilator unit which is equipped with a fan and filter. In many cases these have a controllable mixing damper to permit mixing inside with outside air. Since these usually have a large air capacity and a high velocity discharge there is a certain amount of evaporative cooling taking place when they are used. A feature of these units is that they are frequently so designed as to keep out outside noises, and they are equipped with adjustable louvers and silently operating fans. One of these devices is also here illustrated.

Gas Heating

Although none of the projects previously described is heated by gas, this type of heating is reported to be making headway, particularly in large housing projects. In addition, a comparatively recent development in four-family flat heating by gas is well worth noting.

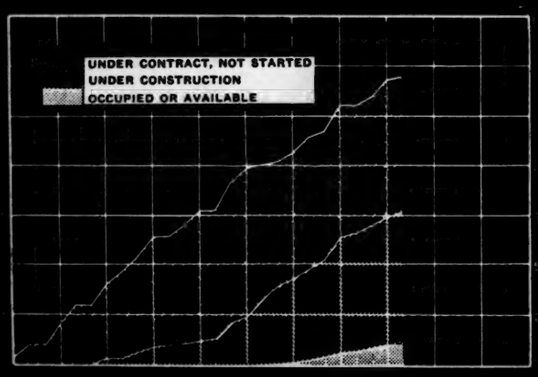
The four-family apartment, usually built in rows, constitutes a large part of residential construction in Washington, D. C. These buildings, two stories in height with four dwelling units, two upstairs and two down, often are a single building, although occasionally there are public walls and the structures are built under one roof. A considerable number of these new buildings are being heated with gas, largely due to the efforts of the Washington Gas Light Co., the gas utility in that city. Forced hot water with small gas boilers is used as a heating medium. The boilers are placed on the kitchen floor in each apartment. Since there is little or no excavation under these buildings the floor beneath is insulated with rock wool, as is the second floor ceiling. The overhead flow lines and underfoot returns are wrapped with insulation to minimize heat loss from the piping. The accompanying sketch illustrates the principle diagrammatically.

There is a moderate proportion of the apartment market in which central heating has never been sold —the low cost so-called "railroad flat" type. An interesting development, extending over the past several years, has been fostered by A. M. Apmann, of the Derby Gas and Electric Co., Derby, Conn., who has thoroughly investigated the possibilities of using gas fired space heaters, both in the railroad flat and in conventional apartments. In all cases the heater location is adjacent to the chimney and provision is made for direct flue connection. Large operating economies are claimed, the reason being, in Mr. Apmann's words, "partly psychological and partly engineering."

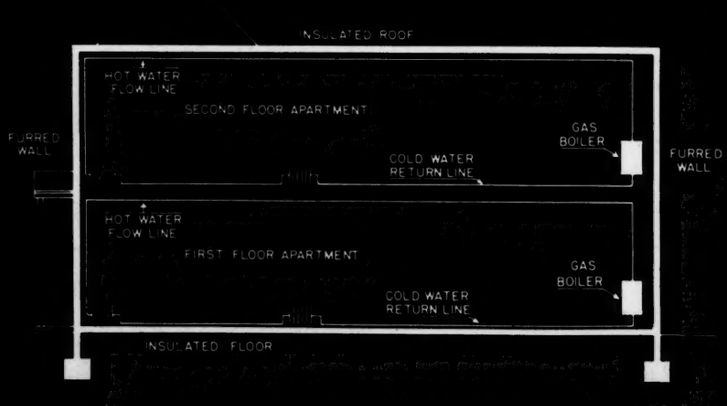
The engineering features which make for the economy of this type of heating are first the use of the jacket loss from the heater for heating the rooms, elimination of starting and piping loss which is present in every central fired system, reduction in flue loss, and the complete circulation of air which reduces air stratification between rooms. However, of equal importance is the fact that the customer heats in accordance with his desire. In many homes it has been the practice to air the bedrooms in the morning and close the doors between these rooms and the rest of the home. Obviously, with such an installation the heater is called upon to heat the space with which it is in proximity. In the case of a central fired installation in the early

(Concluded on page 72)

USHA housing program largely falls in apartment classification. Graph below is cumulative from March 1938 to April 1940, shows that nearly 150,000 dwelling units have been or will be provided under this slum-clearance program.



GRAVITY WATER systems with gas boilers, a separate system for each apartment, as shown below, have been successfully applied in Washington, D. C., sponsored by utility. Drawing courtesy American Gas Association Monthly.



Facts and Fallacies in Heating Piping

PART 4—MAKING EFFECTIVE USE OF HARTFORD RETURN CONNECTIONS

By T. W. REYNOLDS

This is the fourth part of a series of articles in which the author makes some suggestions and criticisms regarding common steam piping practices. The first three articles appeared in April, May, and June issues.

THERE seems to be some misunderstanding among not a few engineers as to when and where a Hartford loop at a boiler is really necessary, possibly due to the inclusion of an equalizer connection, which is there for the sole purpose of preventing any of the water from syphoning out of the boiler, or all of the water should a break in the return occur. This connection does not prevent water from building up in the returns, as steam pressure is admitted to the return at the top of the loop, nor will it prevent rapid fluctuations of boiler water from having their usual effect on the return, as the loop is submerged at its top.

It does prevent excessive backing out of the water from the boiler where there are conditions within the system inviting the return of such water. Fortunately such conditions are infrequent, because any lowering of the relatively large surface of water within the boiler to an appreciable degree will require a lot of horizontal piping to contain so much water. Due investigation of reported cases of water backing out of a boiler usually discloses the fact that the water is leaving the boiler forward through the steam outlets rather than backward through the returns.

A piping loop is further known as a safety loop and as an Underwriters' loop, though its use is not required with boiler insurance. A loop is a form of check valve in itself but without the well known disadvantages of a check valve, hence a loop is desirable as a substitute wherever a check valve would otherwise be used, or where there is a valve at the boiler outlet, or wherever there are two boilers, as these should be equalized and checked so as to prevent interchange of their water at their differing rates of evaporation, and again wherever there is a fair probability of a break in the return.

Barring hearsay, the writer has never visualized or definitely known of a break in a wet return, but has known of leaks developing, due either to corrosion or partial fracture under unusual conditions, such as with extremely long runs of buried returns where proper provision has not been made for expansion or the chances of settlement. Even in such cases, a boiler will not crack if it is provided with an automatic water feeder or low water cut out, or if cold water is not turned into the boiler while empty and overheated. Quite often where the cost of a loop is not in keeping with the risk, the money might have been spent more wisely on a good form of boiler insurance.

The conventional form of Hartford loop as shown in

A NOTE BY THE AUTHOR

Standard piping connections are slavishly reproduced and passed on from one author to another. Quite often they also form an impressive part of our plans and a sacred niche in the specifications. Here they receive most honorable mention before being passed on to the contractor, yet the advantage of many of these connections seems extremely doubtful. This, we do know: they serve but to increase the cost.

These so-called standard piping connections were not originated in this era, but are hangovers from opinionated ideas of long ago which having gained vogue are now hard to dispel. They show little or no change from those thirty years back, notwithstanding the rapid changes that are continuously taking place in practically all other phases of heating.

The need for each of these connections is commonly defended by certain assumptions, or by a line of reasoning which off-hand seems logical because the reasoning is not pursued far enough. Such reasoning might have had some justification in other days where water in pipes was a troublesome factor and when but little was definitely known of what actually took place inside a pipe or fitting. Today we have intensive research with glass pipes, colored liquids and with pipes whose arrangement may be quickly changed at will so as to produce any desired condition for experiment.

Experience acquired in contracting, as well as in trouble shooting over a long period of years at the rate of several trouble jobs per day, eventually caused the writer to show no hesitation in repeatedly violating with impunity many of these sacred traditions with no harmful results. With this in mind, the elimination of waste, and in some cases betterment of method, it is the writer's thought to present herein a number of changes in piping methods which the writer has found along with some others to be the better way. In general these piping methods refer to connections as used in a one pipe steam heating system. Connections common to other systems are so noted, or if not their application is obvious.

Fig. 14a has certain disadvantages peculiar to its own construction, or rather misconstruction, for it is seldom installed correctly, being usually too low and sometimes too high. Many abandoned its use not long after its debut 20 years ago because of water hammer when steam was trapped in the horizontal point of the loop with each fluctuation of boiler water. Departure from the original then became necessary and so this piping stunt was altered as shown by the dotted lines in Fig. 14a with its horizontal length reduced to that of a mere close nipple, but in some cases a certain amount of hard knocking still persisted. At this point evolution again stepped in with the present practice of submerging the top of the pipe 2 in. below water line.

Recommended practice for sizes of the pipe loop are in accordance with grate size of boiler, being either 1½, 2½ or 4 in. Corresponding outside diameters are 1.9, 2.9 and 4.5 in., so with an additional 2 in. allowed for submersion of the horizontal pipe, it is possible with some boilers to expose the crown sheet, especially so where the horizontal connection is installed too low, for water will leave the boiler down to the bottom inside of this pipe. Growing weary of this sort of thing, the writer reasoning that when and where a safety loop must be used it must be built right, published fully fifteen years ago his version of a loop, safe in all respects, as shown in Fig. 14b. This loop is just a simple matter of ordinary piping to suit conditions, yet brought forth enough favorable comment to induce the writer to introduce its use wherever his wanderings took him in the course of these fifteen years. Notwithstanding all this, it has not been included in any published work during that time.

As the sketch shows, there is no horizontal connection at the top of the loop, either to trap steam or to lower the water line, but rather a non-submarine wye fitting installed with inverted apex of the wye at the boiler water line. This hookup gives a minimum of contact of water with steam, overcomes all former objections and produces a loop safe in more than name only, for its top can be installed too low through error by anywhere from 1.9 to 4.5 in. and still be no lower than the standard practice loop.

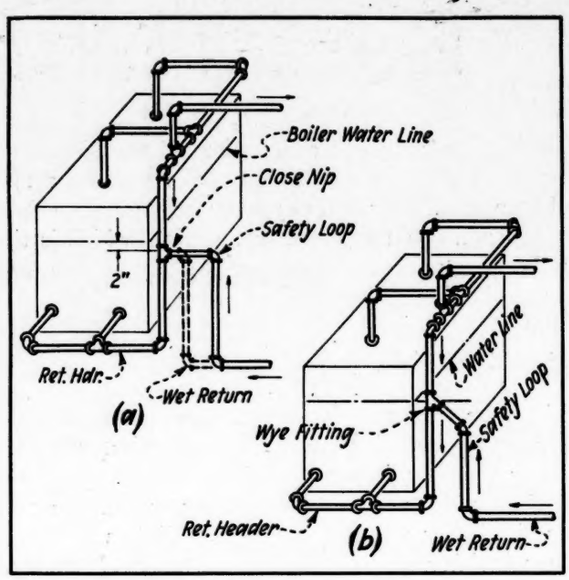


Fig. 14. (a) Conventional form of so-called safety loop, and (b) suggested form of safety loop safe in more than name only.

A feature of a safety loop which is commonly overlooked is the equalizing connection from boiler to crest of the syphon. This pipe usually is taken from any nearby point of the boiler piping or as a drip from the end of the header, whereas it should be run short and direct with as few turns as possible. Frictional resistance of the pipe, burr and the turns of fittings to the weight of steam flowing, will produce a pressure drop at the point where the equalizer connects to the boiler piping. Irrespective of the amount of this drop, whether large or small, and it may not be so small when the system is first heating up, the fact remains that equalization is not desired with this point, but rather with the pressure within the boiler. A direct and separate connection to the boiler is preferable and where such an outlet is not available on the boiler, then the connection should be made to a boiler lead ahead of any fitting, otherwise the boiler water line will lower to a point corresponding to the pressure drop.

Women Much Cooler than Men, Skin Temperature Tests Show

Comparative measurement of skin temperatures have established the fact that the female of the species is much cooler than the male, reported Dr. Yaglou of the Harvard School of Public Health, before the joint meeting of the American Industrial Hygiene Association and the American Association of Industrial Physicians and Surgeons, held recently in New York City.

Dr. Yaglou stated that women's feet and hands were found to average 5F cooler than the masculine extremities, their arms 4F cooler, their legs and head 3F less, with their trunks half a degree cooler than that of the male.

This is one reason, Dr. Yaglou pointed out, why men fume at air conditioning engineers when they provide an indoor temperature that women find just right. But the chief reason why the sexes cannot agree as to what constitutes a comfortable indoor temperature, he said, was that women's clothes were about a third the weight of men's, both in winter and summer, and thus much cooler.

If men would shed their coats and vests, and wear only the lightest underwear in hot summer weather, Dr. Yaglou said, rooms would not have to be cooled below 85F for comfort, whereas the present standard is from 76 to 80F. With men dressed for temperatures of 85F in summer, they would not be exposed, as at present, to the sharp contrasts between the chilly air conditioned buildings and the heat outdoors.

PAPER

INDUSTRY

Scott Paper Company

use 350,000 c.f.m. of mechanical ventilation to flush out hot moist air from paper manufacturing rooms. An additional 150,000 c.f.m. ventilates the power plant.

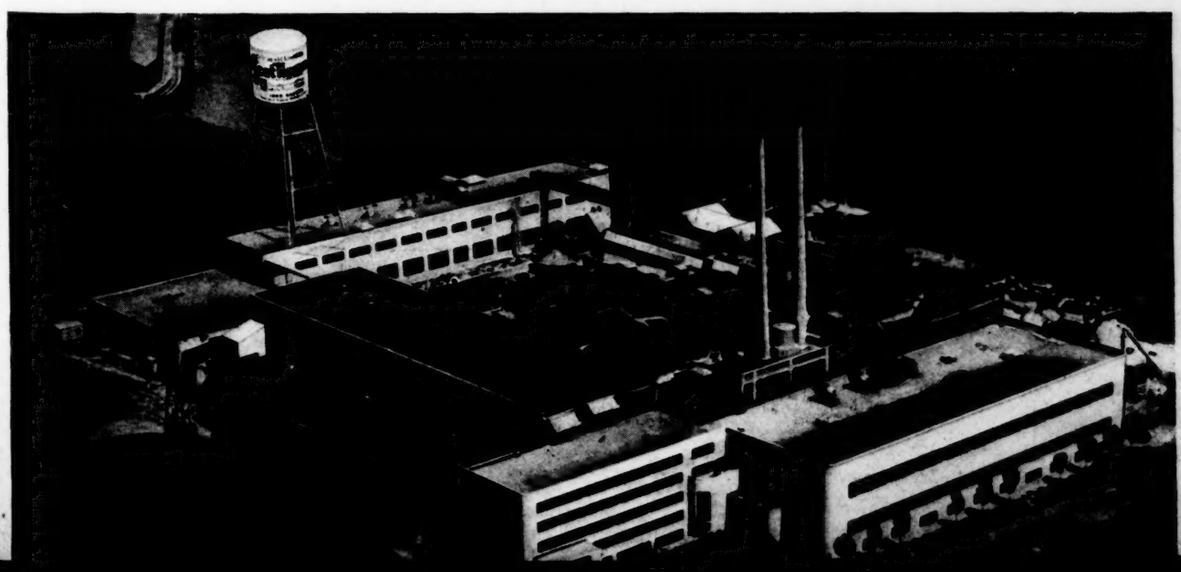
By E. L. BLAIR†

NO. 22 OF A SERIES SHOWING HOW INDUSTRIAL PLANTS PROMOTE PROCESSES AND PROFITS BY SCIENTIFIC CONTROL OF AIR CONDITIONS

IN a paper mill, adequate ventilation is essential not only for the comfort of the operators but also for quality of product and quantity of output. Even in small mills with liberal exterior wall area, mechanical ventilation is necessary. In large mills, with high rates of production and with several paper machines located in the same building, ventilation becomes a major engineering problem.

It has been necessary for the Scott Paper Company of Chester, Pennsylvania, manufacturers of *Scott* and *Waldorf* toilet tissue and *Scottowels*, to expand their manufacturing plant repeatedly during the past ten years to maintain the production required by the increasing sales of these popular products. If space had been available to permit housing operating units in separate buildings, considerable natural ventilation

†Industrial Engineer, Stone & Webster Engineering Corporation.



Chester, Pennsylvania, plant of Scott Paper Company, manufacturers of Scott and Waldorf toilet tissue and Scottowels.

would have been obtained by admission of air through the exterior walls. At Chester, however, space is limited and all manufacturing equipment, as well as the power plant, is housed in contiguous buildings which form practically one structure with relatively little exterior wall area. In this plant, production could not be continued except for the numerous supply and exhaust systems which serve the machines to speed up production and supply the building space with fresh air to make working conditions tolerable.

Air Absorbs Paper Moisture

In this mill, there are nine large paper machines which require huge quantities of air to absorb the moisture evaporated from the paper being dried. The variable speed, direct current motors which drive the paper machines and the motor generators which supply the current for the operation of these motors, are located in aisles between machines and require air for ventilation which can not be drawn directly from the surrounding building space, as this air is already heated by radiation from the paper machines. The high atmospheric humidity which results from the paper drying operation requires an appropriate type of roof construction and ceiling heating by means of a localized warm air supply to prevent condensation. The boiler equipment can not be insulated to reduce radiation losses entirely and the lack of suitable building ventilation by natural means requires the installation of mechanical ventilation equipment to absorb the heat radiated from hot equipment and piping.

Paper is dried by passing it over a series of steam heated rolls. This operation evaporates the moisture in the paper and transfers it to the surrounding air which is exhausted through vertical stacks and exhaust fans and discharged above the roof. Each dryer is enclosed, as far as practicable, in a housing which confines a large part of the hot moist air to prevent it from mixing with the room air and creating excessively high humidity conditions. Housings and uptake stacks are constructed of asbestos board. Exhaust fans, which are installed in asbestos board housings on the roof, are of the high speed propeller type as these have been found efficient in space requirements and power consumption. Each machine is provided with three or more exhaust fans. The total capacity of all exhaust fans serving the nine paper machines is approximately 1,000,000 c.f.m. when the fans are operated at their maximum ratings.

Air for Comfort of Attendants

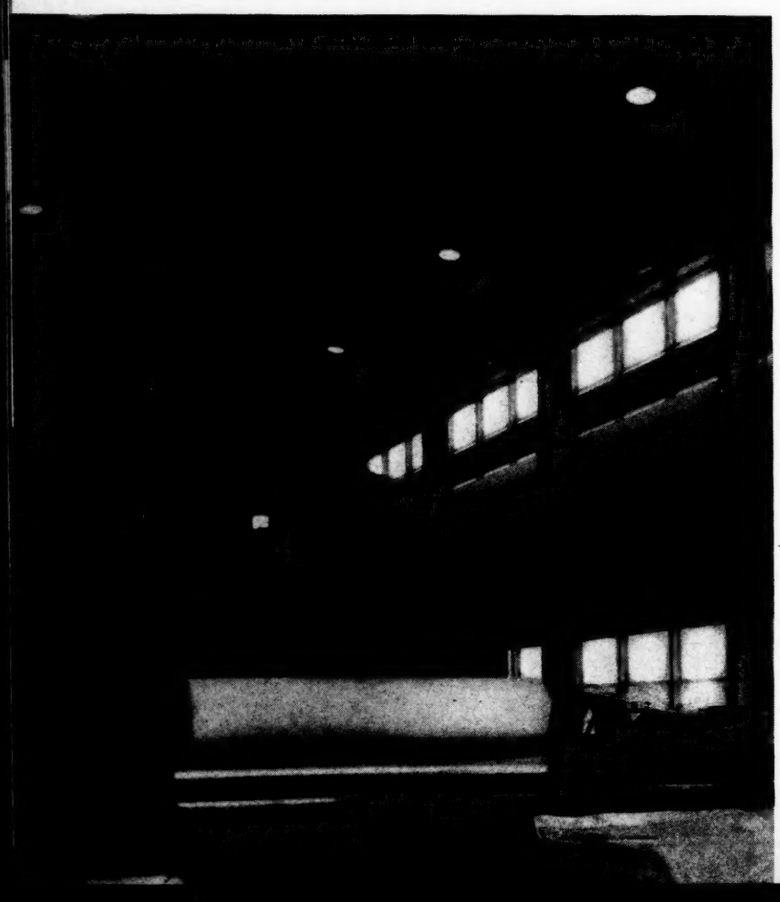
For the purpose of giving evaporative cooling for the comfort of attendants in the machine building, and to counteract heat radiated from the machines, a number of supply systems having a total capacity of approximately 350,000 c.f.m. have been installed for supplying air at high velocities to working areas, for flushing out the hot areas where motor equipment is located and for delivering air directly to duct connected motors. Fresh air was obtainable only from above the roof and, in general, the areas requiring ventilation were in the basement some 50 ft. below. The limited space available and the necessity for clearing the overhead traveling cranes made the design of duct work somewhat complicated, but the actual installation is neat in appearance and does not encroach unduly on the operating space around the machines. The housed centrifugal type supply fans are located on the roof, discharging into ducts which are long and narrow in cross section as they pass between crane rails, expanding into more normal cross sections as they approach the operating floors.

Preventing Roof Condensation

When the first building extension to house a new paper machine was constructed at Chester, considerable thought was given to the proper type of roof so that condensation would be eliminated and cleaning problems would be simplified. The construction finally adopted consists of a truss supported roof of insulated precast concrete slabs combined with a hung ceiling of precast concrete slabs. The ceiling slabs are installed with their reinforcing ribs turned up and are supported on the bottom flanges of galvanized steel members so as to procure a smooth surface on the underside of the ceiling.

In the manufacture of the toilet tissue, some paper fluff is released during the drying operations, which mixes with rising currents of heated air and circulates throughout the building to be deposited on all horizontal exposed surfaces. The smooth ceiling of fireproof construction is of considerable assistance in reducing housekeeping costs and insuring against fires.

The figure shows the appearance of the hung ceiling



Paper is dried by these huge machines which consist of a series of steam heated rolls. Each dryer is enclosed by an asbestos board housing to keep the hot moist air from mixing with the room air. High speed, propeller type exhaust fans located in an asbestos housing on the roof draw the moist air from the dryer housings.

and shows also a typical dryer hood with its uptake stacks.

The attic space above the hung ceiling is utilized to house the supply fan equipment and the distributing ducts which supply heated air to ceiling outlets where it is discharged horizontally at the ceiling level to keep the underside of the ceiling warm and eliminate condensation. The insulated roof combined with the enclosed attic space containing the supply equipment and steam piping assist in maintaining a warm ceiling and reduce to some extent the steam requirements for heating the air supplied to the underside of the ceiling. The construction adopted for the first extension has proven satisfactory and has been used in subsequent additions to the plant with only minor modifications.

Ventilation for Boiler House and Turbine Room

Ventilation for the power plant is provided by a number of large diameter propeller supply fans mounted on the roof. The arrangement of each fan with its suction and discharge duct is extremely simple. The boiler house has a gross volume of approximately 215,000 cu. ft. Six supply fan units are installed which supply a total of 150,000 c.f.m., which amounts to approximately forty-two air changes per hour. The supply fans are each mounted in a horizontal suction duct which is provided with a screened inlet and projecting top arranged to exclude rain. The discharge from each fan is provided with a square elbow and a vertical duct which drops to convey air to the lower levels where it is discharged to the working areas. Exhaust from the boiler house is provided partly by forced draft fans, some of which are arranged to take their suction air requirements directly from the upper part of the boiler room, and the remainder is discharged by natural circulation through hooded openings in the roof.

For the turbine room, ventilation is procured in a similar manner by two supply fans having a total capacity of 40,000 c.f.m. which discharge air angularly downward from the roof at one end and create a lengthwise flow of air through the room to the other end, where it is exhausted through a large hooded gravity exhaust stack.

In general, all of the supply and exhaust systems are provided with no special features or elaborate control equipment. The supply systems serving the machine building and the power plant have been provided without heating equipment. Overcooling of the ventilated areas in the winter time is avoided by shutting down some of the supply fans. The elimination of all special features permitted the handling of the necessary large quantities of air with a minimum investment for the ventilation equipment.

Paper Mills Find Heating Towers Profitable

During recent years several paper mills have found that heating towers, a new innovation in heating equipment, provide an inexpensive means of heating water. A recent issue of *Heat Engineering* gives some interesting information on a tower installed in the Toronto plant of the Gair Company of Canada, Ltd.

Heating towers are much like cooling towers except that they utilize warm air for heating water instead of using cool air and evaporation for cooling water.

In the box-board plant operated by the Gair Company, the hot, moist air leaving the machine room contains a large amount of heat—some as latent heat, represented by the moisture evaporated from the board in drying, and the rest as sensible heat given up by the inactive portions of the drier and by the piping.

To recover this hot moist air, the paper machine was covered with a large hood, extending from the roof beams down to within five feet of the floor. Connecting this hood with the heating tower is a duct in which is mounted an eight-foot, forced draft, Dowmetal fan.

White water, containing chemicals and film from the board machine, is pumped to the top of the heating tower, distributed over the full area and dropped upon a triangular, cascade filling through which the upward currents of hot air flow. The entire tower, including filling, supports and sheathing, is constructed of California redwood. A concrete basin beneath the tower catches the heated *white water* which is then recirculated to the heaters.

The heating tower was designed to heat 230 Imperial gal. per min. of water from 75 to 120F when supplied with 45,000 c.f.m. of machine-room air at 135F D.B. and 75% relative humidity. Provision is made for future operation with a greater volume of air simply by speeding up the fan. In operation the tower has heated as much as 330 Imp. gal. per min. from 88 to 111F when the wet bulb temperature of the air entering the tower was approximately 120F. The heating of this water represented a recovery of 4,550,000 B.t.u. per hr.

The flexibility of this installation may be illustrated by its operation under another set of conditions when 280 Imp. gal. per min. of *white water* from the machines were heated from 94 to 122F by air entering at 126F and leaving at 116F. In this case the air was cooled only 10F but the water was heated to within 4F of the entering air temperature. The heat recovered to the mill system amounted to 4,704,000 B.t.u. per hr., equivalent to 4847 lb. of steam from and at 212F.

Assuming an average cost of $.25 per million B.t.u., the hourly saving amounted to $1.18. Based on an annual operation of 7000 hours, this would be $8,250 per year. It is estimated by the Gair Company that if the mill continues to operate at full capacity, the complete heating tower installation, including all necessary duct work and other alterations, will be paid for within 18 to 24 months.

After nearly two years of operation, the tower is giving highly satisfactory performance. There has been no trouble from spray carry-over, although at times there is a slight amount of vapor. Even in the coldest weather, there has been no difficulty with any part of the tower freezing up since the temperature of the air leaving the unit is always high enough to preclude any such possibility.

DUST CONTROL

in the granite cutting industry is discussed in this article, the second of a series which describes the problem, summarizes technical developments and outlines the limitations of present day exhaust equipment.

By WESLEY C. L. HEMEON†

SURFACING machines consist of pneumatic cutting tools supported on movable horizontal arms in such a manner that the tool is always held at a fixed level for any particular setting of the machine. The tool is held firmly in position and an exhaust hood may be attached directly to the machine without fear of throwing the tool off balance. This system has been generally used in the granite cutting centers of New England for some fifteen years.

Whereas in the case of banker exhaust devices the problem is primarily one of providing an exhaust hood and duct of such design that the workman can move it about quickly and easily as the location of his work changes, this is not the case with surfacing machines. Here, the hood can be located at a fixed distance from the tool and the problem resolves itself into one of providing a minimum of air flow. It has been common practice to provide from 600 to 1,000 c.f.m., but this volume of air has frequently proved to be inadequate to effective dust control.

Effective control may be said to be attained if the average dust concentration is maintained below 10 million particles per cubic foot of air. For practical purposes it may safely be assumed that the control is unsatisfactory if visible dust continually escapes into the air. On the other hand there is no assurance that the absence of visible dust means that a safe condition exists.

New York, in 1931, adopted regulations[1] specifying that all granite cutting tools should be equipped with exhaust hoods connected to five and one-half inch diameter pipes with not less than four inches suction at the hood. This is roughly equivalent to requiring 1,000 c.f.m. The distance from the face of the hood to the point of the cutting tool is not specified, however, and it is obvious that installations could conform with this requirement and yet not provide adequate control of dust.

Encircling Hood for Surfacer Exhausts

Hatch, Drinker and Choate first showed the possibilities of improved control of dust with economical volumes of air by modification of the conventional hood design to provide a partial enclosure of the cutting tool.

As a result of the educational efforts of various agencies in recent years, variations of this idea have taken root in a few places. In Figs. 6 and 7 are shown two modifications of the hood above mentioned, one of which is rather crude in construction. However, both provide excellent dust control for the 4-point chisel with small volumes of air. The disadvantage of each is that when the bush hammer is used the entire hood must be removed, which locates the remaining exhaust inlet a foot or more away from the source of dust.

The type of hood shown in Fig. 8 has proved to be practical and efficient. The principal difference between this hood and the laboratory model referred to above lies in the fact that the encircling portion of the hood which completely encloses the cutting end of the 4-point chisel is readily detachable from the fixed inclined section when a bush hammer is to be used.

The bush hammer produces much less dust than the

†Engineer, Division of Occupational Hygiene, Massachusetts Dept. of Labor and Industries.

[1] "Rules Relating to the Removal of Dust, Gases, and Fumes," Industrial Code Bulletin of N. Y. Dept. of Labor, No. 12, Jan. 1, 1931.

PART 2—EXHAUST FOR SURFACING MACHINES AND ABRASIVE BLASTING

4-point chisel and disperses it less violently. It has been found that control of dust from the bush hammer is adequate when the latter is located immediately adjacent to the exhaust hood with the encircling hood removed.

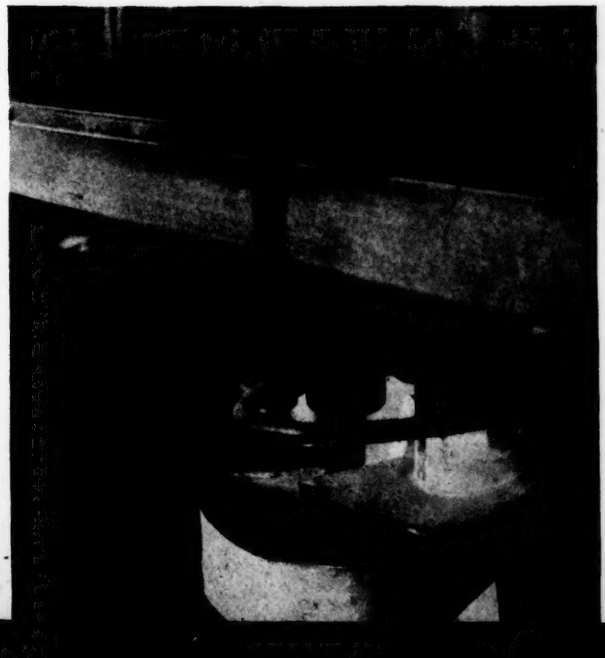
Dimensions of this hood are relatively unimportant, but care should be taken to provide a sufficient distance from the center line of the cutting tool to the edge of the fixed section so that the widest bush hammer may be used without interference. Three inches is a suitable distance and this may be lessened if a cutout is made in the top of the fixed section that is blocked off when the encircling attachment is in use.

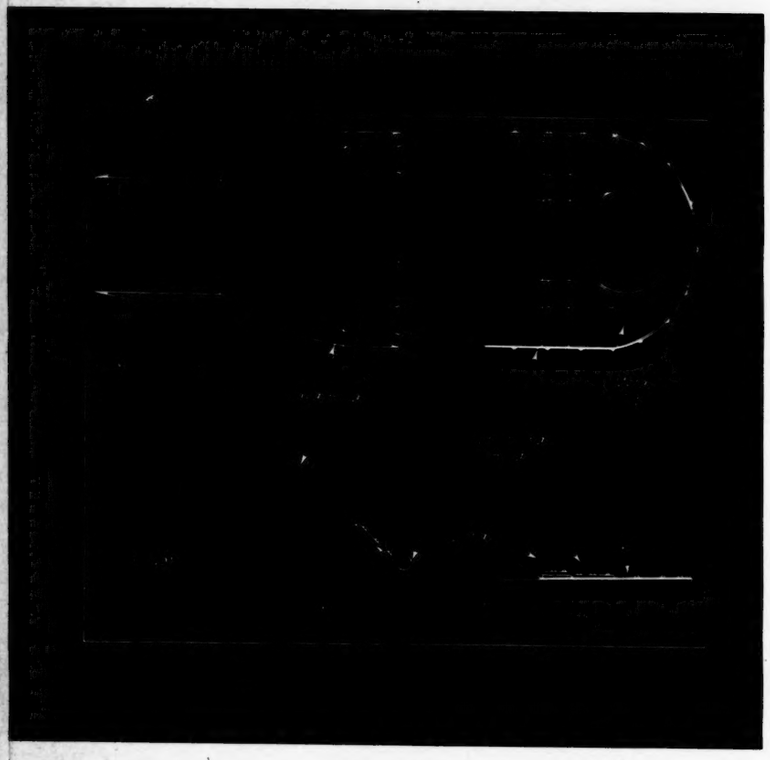
The details of encircling hoods of two different designs are shown in Figs. 8 and 9. Both types have been successfully used in a large number of Quincy stone sheds and workmen like them. Visibility of the stone surface is not unduly obstructed. They should be constructed of metal not lighter than 16 gage. The connecting duct should run between the rails of the machine and be securely anchored to the top and bottom of the surfacing machine body. Provision should also be made for easy vertical adjustment of the hood portion with a range of 6 inches to accommodate, at one extreme, the longest bush hammer and at the other extreme the shortest possible 4-point chisel.

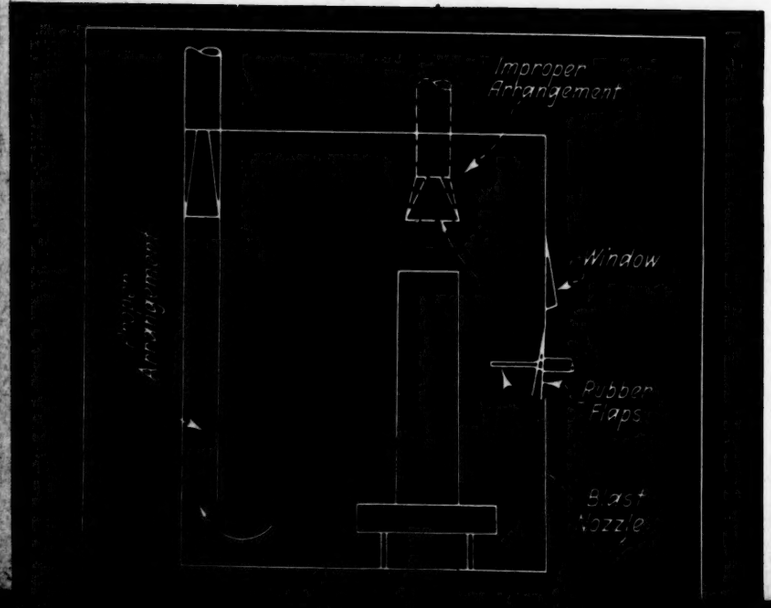
It is common practice in the operation of surfacing machines to direct a blast of compressed air from an exhaust port of the pneumatic machine through a short length of hose onto the surface of the stone, in order to remove small chips from the working area. This practice effectively nullifies the action of the exhaust hood in withdrawing dust and may be eliminated by increasing the effectiveness of the hood.

Fig. 6. (below) Exhaust hood on surfacing machine for 4-pointing which provides excellent dust control for that operation. However, the entire hood must be removed when bush hammer is used.

Fig. 7. (below, right) Exhaust hood for 4-pointing with same disadvantage as one shown in Fig. 6.







DUST CONTROL

One great advantage of the encircling hood for dust control lies in its ability to remove stone chips, as formed, with a small volume of air, thus eliminating the need for the compressed air jet. Furthermore, the hood provides a barrier over the spot where the air jet would be directed.

The Baffle Disc

In the operation of surfacing machines, leakage air from the pneumatic head normally escapes downward around the shank of the chisel and strikes the surface of the stone where dust is being generated, violently dispersing the dust in spite of the suction effect of the exhaust hood. Riley showed the value of a baffle disc in deflecting these currents, and demonstrated, by means of dust counts, that adequate dust control could be obtained with an air flow of 140 c.f.m. for outdoor operation. This quantity of air would not, however, remove the heavy cuttings. The baffle disc has since been widely used and has proved its practicability and value in conjunction with the encircling hood.

The device is illustrated in Fig. 13. The disc should be about 6 inches in diameter, with a center hole to receive the shank of the chisel, and should be of fairly rigid material. Multi-ply rubber, one-quarter inch thick, has been found suitable. Discarded belting may also be used.

Occasionally a pneumatic surfacing machine is encountered in which leakage of compressed air is very small. This is true of new machines. In these cases no benefit is to be derived from use of the baffle disc.

Volume of Exhaust Air

As pointed out in the preceding discussion, an exhaust system for surfacing machines should be capable of removing chips from the surface of the stone as formed. If this end is attained, the control of the small

Fig. 8. A commercial form of hood with encircling section for use during 4-pointing. The detachable encircling hood is linked to the fixed hood by means of a pin (not shown) that passes through the loops of the coupling. Here the distance from the coupling to the center lines of the tool is 5 in.

Fig. 9. Another commercial form of hood generally similar to that shown in Fig. 8. In this case the distance from the coupling to the center line of the tool is 3 in. which is the closest that the tool center can come to the edge of the fixed hood and still provide enough clearance for the bush hammer. This smaller distance is an advantage over the arrangement shown in Fig. 8. The metal top shown here is also sometimes preferred as more effectively shielding the operator's face from flying chips.

Fig. 10. End view of abrasive blasting chamber illustrating correct and incorrect locations of exhaust. Improper arrangement permits abrasive to rebound directly into exhaust opening and thus to be lost.

respirable dust particles will be assured. It has been found that an air flow of 600 c.f.m. when the encircling hood and baffle disc are employed is sufficient under all normal operating conditions. Some plants are operating satisfactorily by employing these devices with only 350-400 c.f.m. of exhaust air. In these cases, however, removal of chips is not complete.

Early work indicated the necessity for a linear velocity of air at the cutting tool of 2000 ft. per min. to control the dust from the 4-point chisel. Measurements made by the author indicated that with the baffle disc a velocity of only 500 ft. per min. is sufficient.

Abrasive Blasting

The use of sand for abrasive blasting of ornamental designs and lettering on the surface of granite monuments has been almost entirely replaced by artificial abrasives, thus rendering the term *sand blasting* somewhat of a misnomer. Except where sand is still used, the hazard of silicosis arises from the fine dust that results from pulverization of the granite in the blasting process.

Blasting Process

The face of the granite block that is to receive the design is covered with a thick sheet of a rubber-like composition. The design and lettering is then traced on the surface of the mask, after which portions are cut away, exposing the surface of the stone in the pattern of the decoration. The stone thus prepared is placed inside a ventilated room and a workman, standing on the outside, directs the abrasive blasting nozzle at the pattern. The portion masked by the soft material is unaffected by the abrasive blast, while that exposed is abraded to any desired depth.

Commercial blasting rooms differ mainly in the construction of their front walls. These are arranged for convenient manipulation of the blasting nozzle, adequate visibility of the work inside, and protection against rebounding abrasive. The necessary flexibility of movement is commonly provided for by a front wall consisting of a heavy curtain whose top and bottom ends are wound on horizontal rollers, thus permitting ready vertical movement of working openings.

Air Volumes for Blasting Rooms

The ventilation of such rooms presents no unusual or difficult problem. When the room is well constructed with a tightly fitting door, a glass window and an opening for the blast-nozzle which is closed by rubber flaps, small volumes of air are adequate to prevent outward escape of dust. Tests on one such room eight feet long with an exhaust of 600 c.f.m. showed satisfactory control of dust. On opening the door for inspection of the work, however, the air did not become clear for several minutes. An air flow of 1600 c.f.m. resulted in rapid clearing of the air on opening the door. Although this factor is not an important one from the hygienic standpoint, since the workman enters the room for only a few moments and infrequently, it is advisable, in the case of new installations, to provide for a greater flow of air than the minimum indicated above.

It is recommended in general that an air flow of about 1200 c.f.m. be provided for a room eight ft. long, or 150 c.f.m. per foot of length. The width and height of the room (working openings range along its length) beyond that necessary to accommodate the work is obviously of no importance in estimating the necessary flow of air. Window openings should always be closed with glass protected by wire screening, otherwise a flow

Fig. 11. (left) Shape carving room. The operator stands at the right, manipulating the blast nozzle through armholes shown The slanted portion is glass covered. Fig. 12. (right) One of present forms of detachable encircling hood for 4-pointing. Note method of attaching exhaust duct to machine. Top anchorage not visible.

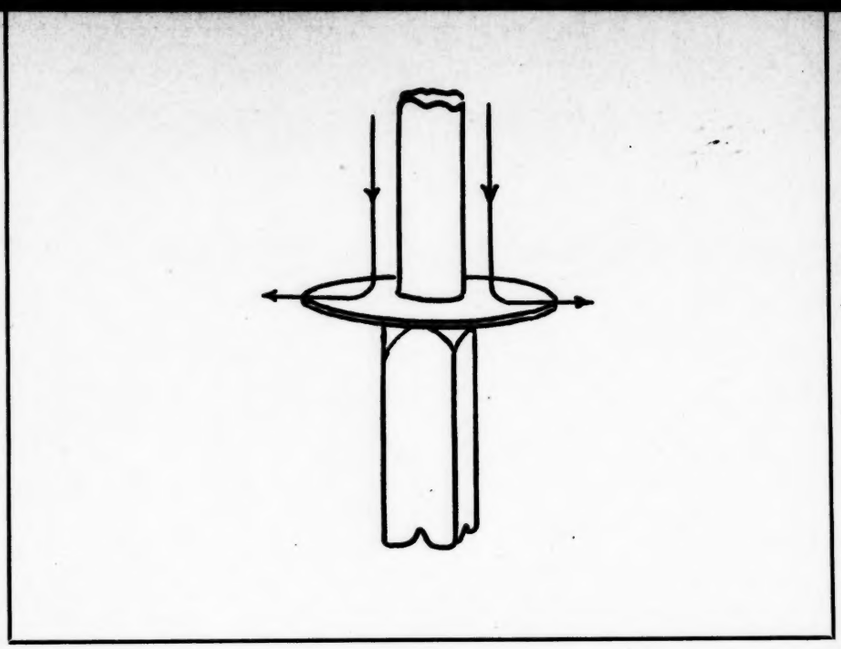


Fig. 13. (above) Baffle disc on 4-point chisel for deflecting jets of compressed air leakage. Often useful on existing systems in conjunction with encircling hood when exhaust is otherwise insufficient.

Fig. 14. (left) Shape carving hood raised and lowered by a chain fall. Armholes in side curtains and glass top may be seen. Small fan attached to top discharges through a canvas duct to the exterior. The propeller fan in this shop (a hang-over from a previous installation) should not be necessary.

of air should be provided to produce an inward velocity of 500 ft. per min. through such opening.

It is possible, theoretically, to construct a room so tightly that no mechanical ventilation would be necessary to prevent the escape of dust into working areas, but actually the accumulation of suspended dust within the room would become so dense as to seriously impair visibility.

Exhaust Outlet for Blasting Rooms

The exhaust outlet from the blasting room should be so arranged as to withdraw as little as possible of the abrasive into the exhaust system, since this material is expensive and re-usable. Fig. 10 illustrates a good arrangement and a poor one. The superior one provides a vertical passageway of large cross-sectional area between the back wall and a partial false wall which prevents lifting of heavy abrasive particles out of the room. In the incorrect method, the hood opening, by being in direct line of sight of the blasting point, permits abrasive particles to rebound into the exhaust opening and thus to be lost.

Transporting Velocity

The size of particle that can enter the duct leading to the fan in a properly constructed room is limited by the low air velocity in the large vertical passage within the room. Such velocities will practically never exceed 800 ft. per min. which would permit a velocity in the connecting duct almost as low. However, seldom do the economics of the matter justify larger pipe sizes than those resulting in air velocities of 2000 ft. per min. and, where the length of duct is not great, even higher velocities, permitting smaller pipes, will be used.

Shape Carving

Certain desired ornamental effects that cannot be secured by means of the ordinary abrasive blasting apparatus are obtained by means of the process called shape carving, or simply shaping. This process employs an abrasive blasting nozzle of much smaller size, and steel shot instead of artificial abrasive. The nozzle is held in the hand, like a pencil, and its manipulation requires a good view of the work at close quarters.

This work is frequently done, inside a ventilated room, by a workman wearing a supplied air helmet.

Other methods obviating the necessity of wearing a helmet are illustrated in Figs. 11 and 14. Fig. 11 shows a small room similar to a large blasting room, but with glass-covered windows set at a slight angle to the horizontal and close to the work. This is a favorite apparatus with many operators. In this photograph an exhaust inlet close to the work will be noted. This would cause loss of shot if velocities in the hose and connecting duct were great enough. A better arrangement would be to have the exhaust inlet at a distant point in the room, with an air supply opening close to the work.

The apparatus in Fig. 14, supported by a chain-fall, is lowered over the stone to be carved and side-curtains fastened around its bottom. Arm holes with attached sleeves are shown in the photograph. The exhaust from the small fan mounted on top of the hood passes through a cloth duct to the exterior.

Very small volumes of air are sufficient to provide satisfactory visibility for this operation because of the relatively small amount of dust formed. Such apparatus can easily be operated without the escape of dust with an air flow of 100-200 c.f.m. if the enclosure is reasonably tight.

WOOD FRAME WALLS

CONSTRUCTION NO. (ON H. & V. REFERENCE DATA SHEET 73 OR 74)	PAINT	FACING	HOURS OF DAY: 8 AM	10	12 NOON	2 PM	4	6	8	10	12
			WHEN TEMPERATURE DIFFERENCE GIVEN BELOW IS MULTIPLIED BY THE OVERALL COEFFICIENT, U, THE PRODUCT IS THE ACTUAL RATE OF HEAT FLOW TO INDOOR AIR, IN B.T.U. PER HR. SQ. FT.								
WOOD SIDING 25/32" WOOD SHEATHING PLASTER ON STUDDING NO INSULATION — 41 B		N*	4	8	12	14	15	14	11	8	4
	LIGHT	E	24	26	26	25	22	19	14	9	4
	LIGHT	S	7	15	21	23	22	19	15	10	6
	LIGHT	W	4	9	18	30	35	31	25	18	12
	DARK	E	39	39	36	33	28	22	16	10	4
	DARK	S	10	20	29	30	27	23	18	12	7
	DARK	W	4	10	24	42	50	44	35	26	17
WOOD SIDING 25/32" WOOD SHEATHING PLASTER ON STUDDING ROCK WOOL FILL — 41 H		N*	0	4	8	11	13	13	12	10	7
	LIGHT	E	15	20	21	22	21	19	16	12	8
	LIGHT	S	1	8	15	19	20	19	16	13	9
	LIGHT	W	1	5	11	20	28	29	25	20	15
	DARK	E	25	32	31	29	27	23	18	14	8
	DARK	S	2	10	20	25	25	23	19	15	10
	DARK	W	2	5	13	27	39	41	35	28	20
WOOD SIDING 25/32" RIGID INSULATION FOR SHEATHING PLASTER ON STUDDING — 42 B		N*	3	7	11	14	15	14	11	9	5
	LIGHT	E	22	24	25	24	22	19	15	10	5
	LIGHT	S	6	14	20	22	22	19	15	11	6
	LIGHT	W	3	8	17	28	34	31	25	19	13
	DARK	E	35	37	35	32	28	23	17	11	5
	DARK	S	8	19	27	29	27	23	18	13	7
	DARK	W	4	9	21	39	48	44	36	27	18
BRICK VENEER 25/32" WOOD SHEATHING PLASTER — 50 B		N*	3	3	5	8	10	12	12	12	10
		E	14	23	26	25	24	22	19	16	12
		S	3	6	12	19	22	21	20	17	14
		W	6	5	7	15	26	34	33	28	23
BRICK VENEER 25/32" WOOD SHEATHING PLASTER ON STUDDING ROCK WOOL FILL — 50 H		N*	4	4	4	6	8	10	11	11	11
		E	8	14	20	21	20	19	18	16	14
		S	5	5	7	12	17	19	19	17	15
		W	8	7	6	9	16	24	28	26	22
BRICK VENEER 25/32" RIGID INSULATION FOR SHEATHING PLASTER — 51 B		N*	3	3	5	7	10	11	12	12	10
		E	12	21	24	24	23	21	19	17	13
		S	4	5	10	17	21	21	20	18	14
		W	6	5	7	13	23	31	31	29	23

* USE ALSO FOR SHADE

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The table on the other side of this sheet, prepared by C. O. Mackey and L. T. Wright, Jr., based on a method outlined in the March and April 1940 issues of HEATING & VENTILATING, can be applied for finding the amount of heat flow through certain wood frame walls at various hours of the day. The table is based on a value of 4 B.t.u. per hr. sq. ft. deg. F for the outside air film coefficient and consequently, when used with the overall coefficients given in HEATING & VENTILATING's Reference Data 79, the calculated heating loads are on the safe side.

The table is calculated for a North latitude of 40 degrees but it is believed that the effect of latitude for any city in the United States is slight and probably less than 3%. The table is also calculated on an indoor D.B. temperature of 80F. If another indoor dry bulb air temperature, t, is used, add (80 — t) to the temperature differentials given in the table on the other side.

It should also be noted that the table is calculated for a typical design day in mid-July in which the outside D.B. temperatures vary from hour to hour, as shown in Fig. 1 below.

It is believed that the table with its rational basis should give the combined contribution of air temperature difference and sun effect to the cooling load at any hour of the design day.

Similar tables for certain Walls of One Material will be found in HEATING & VENTILATING's Reference Data No. 175-176 and for certain Roof Constructions, in HEATING & VENTILATING's Reference Data No. 179-180.

Attention is also called to HEATING & VENTILATING's Reference Data No. 83-84 in which a method of estimating the sun effect on walls is presented. The data on this sheet, to some extent, supersedes the information given there.

Example: What is the heat load at 4 p.m. and 6 p.m. on a typical sunny July day due to sun heat and air temperature difference on the walls of a building whose wood frame consists of studding, wood siding, 25/32 inch wood sheathing, plastered on the studding and with no insulation? The siding is painted a light color. The net wall areas are as follows: north and south walls, 20,000 sq. ft.; east and west walls, 10,000 sq. ft.

SOLUTION: It will be seen that the wall construction designated is 41B in HEATING & VENTILATING's Reference Data 79-80, and the value of the coefficient U is 0.24 B.t.u. per hr. per sq. ft. Examination of the accompanying table shows that the rate of heat flow to the indoor air at 4 p.m. and 6 p.m. is as follows:

	4 P.M.	6 P.M.
North Wall.....	20,000 × 0.24 × 15 = 72,000	20,000 × 0.24 × 14 = 67,200
South Wall.....	20,000 × 0.24 × 22 = 105,600	20,000 × 0.24 × 19 = 91,200
East Wall.....	10,000 × 0.24 × 22 = 52,800	10,000 × 0.24 × 19 = 45,600
West Wall.....	10,000 × 0.24 × 35 = 84,000	20,000 × 0.24 × 31 = 74,400
TOTAL.....	B.t.u. per hour = 314,400	= 278,400

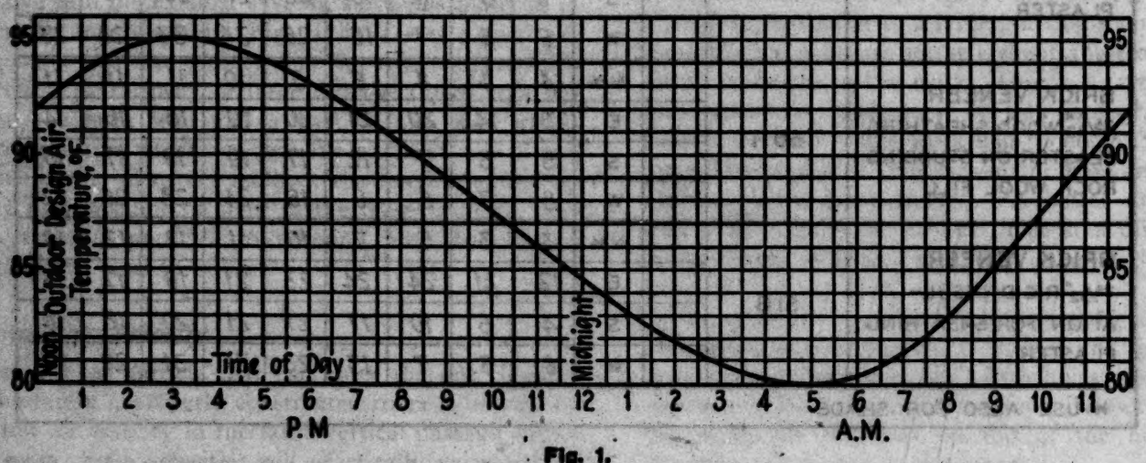

Fig. 1.

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H. & V.'s REFERENCE DATA—178

ABSTRACTS of Current Papers, Books and Pamphlets

Plumbing

This is a practical book on how to design and install plumbing in all types of buildings. The author is well qualified to write such a book as he is a licensed journeyman plumber and has been in the contracting business for a number of years. He has also taught plumbing in vocational schools. While the book is written in such a style as to make it readily usable for beginners and apprentices, the experienced plumbers and designers will find much of value in it.

The book contains a large amount of data on both the design and installation of plumbing equipment. A list of some of the chapter heads follows: Municipal Sewage Disposal; Private Sewage Disposal; House Drain Appliances; Soil Pipe; Traps Used on Plumbing Systems; Ventilation; Soil, Waste, and Vent Pipe Principles; Materials Used for Water Distribution; House Service; Pumps and Lifts; Cold Water Distribution Systems in Tall Buildings; Domestic Hot Water Supply; Private Water Connections; Fire Line Installation; Plumbing Fixtures, and Questions Pertaining to Plumbing.

[*"How to Design and Install Plumbing," by A. J. Matthias, Jr. Published by the American Technical Society, Drexel Avenue at 58th Street, Chicago, Ill. Cloth bound; 6 x 9 in.; 388 pages. Price, $3.*]

BRIEF REVIEWS

FUELS. A review of the principal differences in operating characteristics that show up in changing from pulverized coal to natural gas, or vice versa. These are especially important with units operating at high total steam temperatures where the maintenance of uniform steam temperature may present a problem. Also, the simultaneous use of these fuels is likely to interfere with the proper functioning of automatic combustion control and it becomes necessary to determine the proper CO_2 to carry for each mixture. [*"Intermittent Burning of Gas and Pulverized Coal," by H. A. Kleinman. Published in Combustion, 200 Madison Avenue, New York, N. Y., May, 1940, pages 45 to 47. Price, single copies, 25 cents.*]

HEAT TRANSFER. Data are presented for heating water as it flows by gravity in turbulent motion down the inner walls of vertical copper pipes, ranging in height from 0.41 to 6.1 ft. Heat balances check within 5% and the temperature of the inlet water ranges from 38 to 146F. Steam-side and over-all coefficients are given. The rather inadequate data for streamline flow by gravity over nearly horizontal pipes (trombones) are reviewed. [*"Heat Transfer to Falling Water Films," by W. H. McAdams, T. B. Drew, and G. S. Bays, Jr. Paper presented at the annual meeting of the ASME, December 4-8, 1939. Standard size; 5 pages. For copies write American Society of Mechanical Engineers, 29 W. 39th St., New York, N. Y.*]

AIR CONDITIONING. A discussion of the reaction of workers to atmospheric conditions. Paper presented at the Production Conference of the American Management Association in Chicago during November, 1939. [*"Reactions of Workers to Atmospheric Conditions," by F. C. Houghten and A. A. Rosenberg. Thirteen pages. Available from the American Management Association, 330 West 42nd Street, New York, N. Y.*]

OIL BURNERS. A report of the difficulties encountered and their successful solution when burning a heavy petroleum cracking-still residue as a fuel in combination pulverized-coal and fuel-oil burners for the boilers of the American Viscose Company powerhouse at its Marcus Hook plant. Though the problems involved were comparatively simple, the development of a burner arrangement to achieve a solution and the results obtained may be of value to the designers and operators of boilers who are in search of both flexible and efficient combination firing equipment for pulverized coal and fuel oil in boiler plants. [*"Successful Mechanical Atomization of Fuel Oil Heavier Than Bunker C," by G. G. Martinson. Paper presented at the spring meeting, Worcester, Mass., of the ASME, May 1-3, 1940. For copies, write American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y.*]

DRYING. Deals with an investigation of moisture-regain values for salt-fish muscle which shows a particularly rapid change in the range between 60 and 70 per cent relative humidity. The determination of experimental drying-rate curves in this range requires study, for much of the commercial drying as now carried out is done within this range. The author describes the system customarily used for this purpose. Dry and wet bulb regulators, employing thermionic relays capable of giving control of experimental air conditions in the order of 0.01F dry and wet bulb, were used in the investigation. [*"Experimental Drying," by D. L. Cooper and A. L. Wood. Paper presented at the spring meeting, Worcester, Mass., of the ASME, May 1-3, 1940. For copies, write ASME, 29 West 39th Street, New York, N. Y.*]

CALIFORNIA CLIMATE. A report of the air conditioning committee of the Pacific Coast Electrical Association on climatological data. Table 1 presents the following data for 70 cities: July mean wet bulb F at noon; July mean per cent R.H. at noon; July mean F at noon; highest temperature on record F; July mean maximum temperature F; July mean minimum temperature F; lowest temperature on record F; mean January minimum temperature F; mean January temperature F; summer water main temperature F, and elevation. Table 2 presents mean dry bulb temperatures for 33 cities while table 3 presents mean temperature and humidity data for Fresno, California. [*"Report of Air Conditioning Committee 1939-40." Published by the Pacific Coast Electrical Association, Inc., 601 West Fifth Street, Los Angeles, Calif. Paper cover; 8 pages; 8½ x 11 in.; available on request.*]

NEWS OF THE MONTH

New England Air Conditioning Institute Highly Successful; Carrier, Yaglou, Wells, Cushing and Johnson on Program

CAMBRIDGE, MASS. — Over a hundred men gathered at the Massachusetts Institute of Technology June 11-12 for the first annual New England Air Conditioning Institute, sponsored by the University Extension Division of the Massachusetts State Department of Education in co-operation with local chapters of the various engineering societies and the Air Conditioning Bureau of Boston.

Those present included consulting engineers, manufacturers and manufacturers' representatives, salesmen, engineers, public utilities executives, heating contractors and architects and others. Over one hundred attended each session and the Institute was considered such a success that it is hoped to conduct a similar affair next year, according to John P. McGrail, Supervisor in Education of the University Extension Division.

Willis H. Carrier was chairman of the opening session and in the afternoon talked on Industrial Air Conditioning briefly, saying that industrial air conditioning has improved production and efficiency generally between five and ten per cent and in the rayon industry at least, an improvement of 15% has been obtained. Some large industrial plants have been enabled to operate 24 hours a day, since weather in factories is now controlled. Air conditioning has made possible in the industrial field processes hitherto believed impossible, and is destined to play an even more important part in the country's rearmament program. Temperature control now possible in munitions plants will greatly increase production and decrease the possibilities of explosions.

Dr. W. J. McConnell, of New York, in a short address, said that an almost unexplored field in air conditioning lies in its possible application in a wide variety of diseases, including certain skin dermatoses, superficial infections, rheumatic diseases and other forms of arthritis, which in many cases have responded favorably to controlled air environment. Just what role air conditioning plays in the prevention of spread of infectious organisms remains to be demonstrated. Conditioned air is rapidly replacing other measures for inducing artificial fever in the treatment of certain diseases, and its application in the prevention of the allergic diseases through filtration of the air carrying the causative material has been demonstrated with most satisfactory results. So far, at least, no very definite proof has been advanced that air conditioning, as contrasted with adequate ventilation which supplies the essential requirements for reasonably comfortable working and living conditions, has measurably improved health.

Fred Ellis of Buerkel & Company of Boston, spoke on "Air Conditioning Today."

Ralph S. Franklin, consulting engineer, of the Albert B. Franklin Company, Boston, recommended dual-type heating as the most satisfactory method of heating homes. By using warm air in living rooms and bedrooms which can be closely linked with air conditioning, and the use of hot water or steam in kitchen, laundry and bathrooms where odors are likely to be returned by an air circulating system, a nearly perfect home heating system can be obtained, he said. He recommended separate hot water units as the most economical.

Mr. Franklin also discussed panel heating, of which he has made a special study, and examples of which he has installed in the M.I.T. swimming pool, and in the operating room at the Metropolitan Hospital, as well as one or two private homes.

E. Daniel Johnson, third speaker at the first morning session, in his paper on Spray Humidifiers and Dehumidifiers, said that in large cities, where there is considerable oil, smoke and sulphur vapor present, where the spray equipment takes in practically all outside air, it is almost necessary to use copper construction. In Boston, for example, he said that a galvanized iron air washer taking all outside air will last from three to eight years, whereas a copper washer will last almost indefinitely. Outside the larger cities, he reported, the galvanized iron washer will last fifteen to twenty years, probably requiring only a few replacements of parts.

Cleaning efficiency of the air washer depends a great deal upon the type of dirt in the air, the speaker claimed. Where there is dirt that can readily be wetted, the air washer does a very good job. It is not so good when there are large quantities of carbon and oily dust. In the former case a single spray air washer with scrubbing plates will give approximately 98% cleaning efficiency by weight. This same unit with the spray nozzle shut off and with only the scrubbing surface continually wetted will give a cleaning efficiency of about 95%. There is the advantage with this type of unit of being able to get cleaning at all times without the addition of moisture in the summer time when additional moisture is objectionable, the resistance of the cleaning unit remaining constant and the air quantities handled by the fans consequently remaining constant.

Mr. Johnson said that his company has recently been running a lot of experiments in cooperation with the State of New York, using its own foundry as a laboratory. It was found that the cleaning efficiency can be increased by use of detergents, which can be added to the water in small quantities and makes the water "wetter", with the result that oil and carbon particles form an emulsion with the water and can be eliminated very readily. These detergents cannot be used economically, however, unless it is possible to recirculate the water in the washer.

The speaker said that to eliminate odors on a simple air washer used in a ventilating system, it is necessary to change the water frequently. There are many districts where the water will go one to two weeks without changing, but there are other places where it requires changing every two or three days, to keep down odors and bacteria count.

A single bank washer has a humidifying efficiency of about 70%, which is generally sufficient for winter humidifying with the proper control. A double spray unit has a humidifying efficiency of about 95%, he reported. Of course heat of evaporation must either be added by heating the air or heating the water. Sprays in an ordinary washer, either single or double bank, operate at about 20 lb. pressure.

The essential difference between a humidifier and a double bank washer is that in the humidifier we use spray nozzle orifices and spray water at higher pressure in order to get finer atomization, usually at 30 to 35 lb. Another difference in the humidifier is that there is usually a set of eliminators on the suction side to prevent the eddies from carrying the water back through the intake. There are some industries where there is so much heat given off from power machines that a humidifier properly applied will, in great degree, produce effective temperatures in summer reasonably satisfactory for human comfort.

Following luncheon, the meeting was resumed with Dr. C. P. Yaglou of the Department of Industrial Hygiene, Harvard School of Public Health, presiding. J. P. Hare, refrigeration engineer, of the York Ice Machinery Corporation, Boston, was the first speaker, on "Refrigeration."

Mr. Hare divided air conditioning systems into two types, direct and indirect, and said that generally the direct system is used on the smaller

units and the indirect system on the larger systems but that the choice also depends on the specific type of application. He said that the trend of design of reciprocal compressors is toward multiple-cylinder, dynamically balanced machines operating at high rotative speeds, with cylinders arranged in V, W or VV formation. One of the results, he said, of the development of the multiple high speed compressor has been to reduce the weight of reciprocating parts. This makes possible dynamic balancing with resultant elimination of objectionable vibration.

Cooling by dehydration was discussed by C. F. Cushing, manager of air conditioning sales for the Bryant Heater Company of Cleveland. Mr. Cushing explained the uses of various salts used in air conditioning, also adsorbent solids, such as silica gel and activated alumina, used in standard commercial air conditioning equipment systems. All laminated glass in the United States and Canada is now made in air conditioned plants, most of them using these "dry air" machines. He showed a number of slides on which were to be seen diagrams of various types of installations, using gas as the dehumidifying and heating medium.

H. F. Hagen, vice president in charge of research, B. F. Sturtevant Company, next discussed "Fans and Air Distribution."

James Holt, associate professor of mechanical engineering, M.I.T., presided at the second morning session, at which Professor Philip Drinker of the Department of Industrial Hygiene, Harvard School of Public Health and inventor of the famous "iron lung" for victims of infantile paralysis, addressed the meeting on "Atmospheric Pollution and Air Cleaning." He was followed by James W. H. Myrick, director of the division of smoke inspection, Mass. Dept. of Public Utilities, on "Smoke Abatement."

Daniel Ricker, president of the Air Conditioning Bureau was chairman of the second afternoon session, at which John H. Barrett, engineer of the Minneapolis-Honeywell Regulator Company, Boston, spoke on "Temperature and Humidity Controls." Paul D. Close, technical secretary of the Insulation Board Institute, Chicago, was the second speaker, with a paper on "Insulation Against Heat, Humidity and Sound."

Mr. Close outlined the theory of insulation in connection with heat transfer through building materials, gave some attention to the theory of dead air spaces, discussed fuel savings and reduction in heating plant sizes possible with insulation, and pointed out that in addition to saving fuel bills with insulation, it enabled the maintaining of lower temperatures in the summer and added that additional effect of insulation is to reduce drafts.

In reference to humidity insulation, Mr. Close said the primary purpose of humidity insulation is to prevent condensation on interior wall and ceiling surfaces during cold weather. This condensation problem is associated primarily with industrial conditioning where exceptionally high relative humidities are maintained, rather than with comfort conditioning. Mathematically the solution is as follows: 1. Ascertain the dewpoint temperature likely to be encountered. This temperature represents the minimum permissible surface temperature if condensation is to be avoided. 2. Next ascertain the inside air temperature near the surface involved as well as the minimum outside air temperature likely to be encountered. 3. Calculate the required resistance of the structure to prevent surface condensation on the basis that the temperature gradient is proportional to the resistance. In other words, the total resistance required to prevent surface condensation is to the inside surface resistance as the total inside-outside temperature difference is to the difference between the inside air temperature and the required inside surface temperature. 4. Estimate the heat resistance of the part of structure involved, whether wall or roof. This total resistance is obtained by adding the component resistances of the structure, including inside and outside surface resistances. 5. Subtract the actual resistance of the structure (without insulation) from that required to preclude surface condensation. The result is the amount of heat resistance in the form of insulation that should be added. Knowing the conductivity of the insulation under consideration, the thickness readily can be determined. The problem of condensation in certain types of insulated walls is not generally regarded as serious, and if damage from this source is imminent, certain efficient vapor barriers applied to the warm side of the wall or ceiling will preclude trouble.

Some interesting facts about lighting systems in connection with air conditioning systems, many of them new to the engineers present, especially the new fluorescent lighting, were brought out by R. B. Brown, Jr., illuminating engineer, Boston Edison Company, in his address on "Lighting in Air Conditioning."

Lighting systems in common use, said Mr. Brown, produce heat, 3415 B.t.u. per kw. hr. With the increasing demand for high level lighting, the heating effect becomes a problem for the air conditioning engineer as well as the lighting engineer.

In considering the relative heating effect of fluorescent lamps as compared to incandescent, the speaker said that it is pretty well established that the fluorescent lamps give twice as much light per watt as the incandescents. For a given level of illumination therefore, the total watts and therefore the total heating effect of the fluorescent system would be one-half that of the incandescent system.

But this is not the complete story, he went on. Incandescent lamps dissipate 70% or more of their energy in the form of radiant heat which does not appreciably affect the temperature of the air or other transparent substances through which it passes. But it raises the temperature of persons or objects which absorb a portion of this radiant energy and so may give rise to a feeling of warmth, ultimately influencing the temperature of the room by conversion to other forms of heat, by conduction and convection.

Since most of the energy is absorbed by the object receiving the radiation directly from the source, persons working under direct lighting systems will feel the effects of the heat from it to a greater degree than others working under the indirect system, even if wattage in both systems is the same.

Fluorescent lamps, on the other hand, Mr. Brown said, dissipate their energy in a totally different way. Only one-half the heat produced by this lamp is in the form of radiant heat. But in planning an air conditioning system you must base your calculations on the total heat dissipated and that means the total watts consumed by lamps and auxiliaries, not by the radiant heat alone.

Since there has been some attempt to combine lighting fixtures and air conditioning outlets in one unit, it would be well to bear in mind certain limitations as applied to fluorescent lamps. They have entirely different operating characteristics than incandescents. One of their peculiarities is that the efficiency of light production is influenced by the temperature immediately surrounding the tube. As the temperature of the surrounding air goes down, the light output is lowered.

What is most important is the serious effect of drafts. This clearly indicates that fluorescent lamps should not be located in or close to air conditioning outlets where the air immediately surrounding the lamp tubes is in motion. Where the outlets do come in the same location, the lighting fixture should be suspended, or the tubes otherwise enclosed or shielded from direct drafts.

In lighting practice today, he said, there is a pronounced swing to the fluorescent type of lighting. Many of the installations are showing a considerable drop in wattage consumed, which would seem to be some relief from the heat problem. But it would be a mistake to regard this as a per-

(Concluded on page 66)

Gas-Fired Absorption Systems Discussed at Los Angeles Meeting; Hill Describes Southern Counties Gas Co. Installations

LOS ANGELES—Cooling by gas, using the absorption system for air conditioning offices and auditoriums, was the subject of a talk presented by James W. Hill of Los Angeles, heating and ventilating engineer of the Southern Counties Gas Co., at the June 18 meeting of the local chapter, ASHVE. The meeting attracted an attendance of 50.

The 1940-41 officers elected at the May meeting were installed. They were H. H. Douglas, president; Arthur J. Hess, vice-president; Wesley Stewart, treasurer, and Howard Bullock, secretary.

Absorption systems installed in the Southern Counties Gas Company's Pomona and Santa Ana divisional offices, which have withstood service tests embracing two full cooling and heating systems, formed the main phase of Mr. Hill's address.

The Pomona and Santa Ana installations, he explained, are Williams Air-O-Matic machines with a 14-ton capacity, using Freon-21 as refrigerant and di-methyl ether of tetra-ethylene glycol as absorbent. Low pressure steam from separate gas-fired boilers is used by both machines, but electrical energy is employed for driving the absorbent pumps, cooling water and air fan. Both installations use direct expansion coils for cooling and steam blast coils for heating.

The Pomona office system, according to Mr. Hill has a switch-over arrangement whereby cooling may be diverted to an auditorium which is used on an average of three times a week. Heating is accomplished by steam radiators from the same boiler serving the absorption machine, with steam pressure reduced from 14 to 2 lb. While the heating phase is functioning, ventilation air is tempered by steam blast coils in the duct system. Control is semi-automatic, with a thermostat controlling temperature, and selection of heating or cooling regulated by manually-operated switches. A steam blast coil in the air duct is used for heating in the system installed in the Santa Ana office. The fan here is kept in constant operation. Control is completely automatic, since there is no auditorium in this building to complicate matters. Temperature is maintained at a constant level the year-round, except that on cooling, the control holds a maximum of 15F below outside temperature. The system automatically selects either the heating or cooling phase as needed to maintain constant conditions.

Mr. Hill pointed out an interesting phase of this installation, which utilizes cooling during the middle of the day on many days in the winter, with the cycle changing from heating in the morning to cooling during midday, and returns to heating in the later afternoon hours. An experiment conducted with this system disclosed that, with the system turned on and left on full automatic control, it ran 17 months without service of any kind. At the end of that time it became necessary to remove the lime from the evaporative condenser.

The speaker explained that while the Southern Counties Gas Co. has had first-hand experience only with the absorption system insofar as air-conditioning is concerned, it has on its lines a number of ice plants using gas engine driven compressors for the making of ice.

He also explained briefly a gas engine installation used by the Southern California Gas Co. for supplying conditioned air to a portion of its offices on the first, mezzanine and second floors of its home office building in Los Angeles, where Southern Counties Gas Co. also maintains general offices. The installation is a Frick, single action, two-cylinder compressor of 50-ton capacity, and a six-cylinder, 50-hp. Waukesha engine with a top speed of 1300 r.p.m. Engine speed varies from 800 to 1300 and clearance pockets of the compressor can be varied to give 50% reduction in capacity. Depending upon conditions, the capacity of the installation as a whole can be varied approximately 75%. Speed of engine and position of clearance pockets are controlled by thermostats in the return duct.

Mr. Hill declared that to his knowledge this is the only air-conditioning installation on the Pacific Coast having constant suction pressure. The system must be started manually, but thereafter operates under automatic control.

Sterilamps for Tobey Hospital

WAREHAM, MASS.—The new Tobey Hospital here, dedicated May 26, is equipped with ultra-violet ray sterilamps to sterilize the air surrounding the entrance to the nursery, wherein new born babies are kept free from infection 24 hours a day. There is also a large infra-red ray lamp for general heating purposes, together with many unusual X-ray facilities.

Hattis Moves Consulting Offices

CHICAGO—The offices of Robert E. Hattis, consulting air conditioning and mechanical engineers, formerly at 820 No. Michigan Ave., has been moved to 332 S. LaSalle Street. C. E. Berndt, formerly with Alfred S. Alschuler, architect, has been added to the Hattis staff.

Boiler and Radiator Institute Meets

NEW YORK—A quarter century of progress in radiator heating was commemorated at the 25th anniversary dinner of The Institute of Boiler and Radiator Manufacturers at the Hotel Astor here, May 28.

Speakers voiced a general feeling of optimism based on the threefold program of the Institute. The broad promotional activities of the Institute, it was pointed out, include the I-B-R rating program, standardization of radiator sizes, and research.

Because of the forward-looking activities of the Institute, the industry is enabling its members to meet the present day need for constant improvement in the operating efficiency of heating equipment, the 75 members who attended the dinner were told. The members of the Institute, it was said, are not merely keeping pace with new trends in heating but are developing their products along new lines.

New trends in the application of steam and hot water heating to industrial, commercial, and residential uses were noted with approval by the speakers. It was pointed out that panel heating, widely used in Europe, is finding wider acceptance in the United States and speakers claimed that this tendency reaffirms the basic advantages of steam and hot water heating.

George E. Hoffman, manager of the plumbing and heating department, Crane Co., was toastmaster. The principal speaker of the evening was Thomas S. Holden, vice president in charge of statistics, F. W. Dodge Corporation.

Among the members of the Institute who spoke briefly were W. C. Murray, Utica Radiator Corporation, chairman of the Institute; E. W. Smith, H. B. Smith Co., Inc.; R. S. Waters, National Radiator Corp.; and J. F. McIntire, United States Radiator Corporation.

F. W. Herendeen, former secretary of the Institute, spoke in a reminiscent vein, and Mr. Smith briefly outlined the history of the Institute.

Other speakers emphasized various features of the present promotional program of the Institute. Particular stress was placed on the I-B-R rating program and the I-B-R Research Home at the University of Illinois. The Research Home is now under construction and will be used for the running of exhaustive tests on various forms of radiator heat in order that over a period of years complete data can be assembled for advancing the art of radiator heat. The Research Home will be open in the fall.

Mr. Murray, who spoke on the subject of "The Present Program," pointed out that the Institute seeks to mobilize all resources within the industry for the promotion of steam and hot water heating on a broad front.

Washington Chapter Host for ASHVE Summer Meeting; Neilsen, Houghten, McConnell Present Papers

More than 325 members and their guests attended the semi-annual meeting of the American Society of Heating and Ventilating Engineers held at the Wardman Park Hotel, Washington, D. C., on June 16-19. The program included nine technical papers and a number of inspection trips to various points of interest to heating and air conditioning men, as well as the semi-annual banquet and informal party. At the semi-annual banquet, Congressman Luther Patrick addressed the members and their guests, and J. F. McIntire was presented with the past president's memory book.

On Monday morning the technical part of the program was opened by F. C. Houghten who presented a paper entitled, "Summer Cooling Load as Affected by Heat Gain Through Dry, Sprinkled and Water Covered Roofs." This paper reported on tests conducted during the summer of 1939 at the Research Laboratory in Pittsburgh. The conclusions were as follows: (1) When the roof is either sprinkled or flooded the rate of heat flow is greatly reduced. (2) A roof flooded with 6 inches of water has a lower rate of heat flow during the early part of the day and tends to cause the peak in solar heat flow to occur at a later time than does a roof which is covered with one inch of water. (3) A roof which is sprinkled provides the lowest temperature and causes the roof temperature to approach the wet bulb temperature of the air rather than the dry bulb temperature of the air. (4) Aluminum paint can also be used to reduce the heat flow through a roof.

W. J. McConnell and M. Spiegelman presented a paper entitled "Reactions of 745 Clerks to Summer Air Conditioning," which reported on the results of a study undertaken primarily for the purpose of ascertaining the cooling requirements for summer air conditioning in the new unit of the Home office of the Metropolitan Life Insurance Company. As a result of this study the authors concluded that the optimum effective temperature in this building was about 70F for the months of July, August, and September. They also found that the optimum effective temperature for men was 1.2F below that for women and that in general men were not as susceptible as women to discomfort especially at the extremes of temperatures recorded in this study. It was found that in the morning, the optimum effective temperature was about 1F higher than in the afternoon. The authors were not able to obtain any significant relationship between outdoor effective temperatures and indoor effective temperatures.

For some time there has been a question in the minds of investigators as to the effect of room sizes on the performance of radiators and convectors. Previous investigations on the performance of direct steam radiators and convectors in test rooms 9 x 11 ft. with 9 ft. ceilings showed rather large differences between temperature of the air near the ceiling and that near the floor. There was some question as to whether the results obtained in these comparatively small rooms would hold true when the radiators and convectors were tested in larger rooms. To answer this question, A. P. Kratz, M. K. Fahnestock, E. L. Broderick, and S. Sachs, ran a series of tests in a room 15 x 18 ft. with an 8 ft. 6 in. ceiling and reported their results in a paper entitled, "Effect of Room Dimensions on the Performance of Direct Radiators and Convectors." Their conclusions were that the use of a test room as small as 11 x 9 ft. tends to accentuate differences in performance inherent in radiators and convectors while the use of a large test room tends to reduce differences in performance inherent in radiators and convectors but does not alter the performance sufficiently to materially affect conclusions drawn from similar tests made in smaller test rooms. The investigators also found that radiators and convectors which produce the least temperature differences between the air near the ceiling and that near the floor also tend to give the smallest steam condensation.

R. R. Neilsen in a paper entitled "Dirt Patterns on Walls," discussed the causes and methods of reducing the deposits of dirt on the walls of heated rooms. Mr. Neilsen stated that regardless of what method may be responsible for depositing dirt on the walls, the depositing can be minimized by reducing the dirt content of the air. He also stated that people will not object to a relatively large amount of dirt on the walls if it is deposited uniformly. What is objectionable, however, is to have the dirt deposited un-uniformly in lath patterns, for example. In conclusion he stated that of the various methods by which it is possible to produce striated dirt deposits on walls, it appears that thermal gradients are responsible for the majority of those that are formed in homes during the heating season. The principal action of convection in pattern formation appears to be increasing the magnitude of the temperature gradients and in maintaining high dirt concentrations in the air by decreasing gravitational settling out.

An excellent discussion on air flow measurements and intake and discharge openings and grilles was presented by G. L. Tuve and D. K. Wright, Jr. In this paper the influence of each of the six important variables upon instrument readings was discussed for both air intakes and air discharge openings. Also presented was information on the application factors for general use of anemometers and velometers.

Other papers presented included one by Lauren E. Seeley on a study in changes of temperature and water vapor content of respired air in the nasal cavity. This study was one part of a series which is being made to determine if the control of relative humidity in occupied enclosed spaces is really important.

Dr. M. B. Ferderber, F. C. Houghten, and Carl Gutberlet reported on a fever therapy unit which was developed to reduce a local fever by the use of conditioned air.

In a paper entitled "The Methods of Rating the Noise from Air Conditioning Equipment," J. S. Parkinson, outlined the principal objectives for a desirable test code and discussed the nature of the differences of opinion as regards expressing results.

In a paper entitled "Air Conditioning Design," W. A. Brown discussed many of the problems encountered by many of the Government engineers in designing the conditioning system for Government buildings. Among other things, he gave a very interesting account of the new 4200-ton conditioning system which is being installed at the present time in the new Social Security building.

Army May Try Ultra-Violet Light

NEW YORK—Ultra-violet light, something never before used in war, is under consideration to protect the health of fighting men in the United States army and navy and the British army.

This new step in war medicine was described briefly June 10 for the American Medical Association by W. F. Wells, director of the laboratories for study of air-borne diseases of the University of Pennsylvania.

He said inquiries had come from all three services. In the U. S. army it is proposed to use mild ultra-violet lights in barracks to prevent spread of contagion. The U. S. navy wants to try them in ships.

The British inquiry is for their use in hospitals crowded with wounded to prevent spread of air-borne infections which in the past have killed many wounded who would have recovered from their military injuries.

The light used, Mr. Wells said, is a form of ultra-violet which does not appear in sunshine. It is much milder to the human skin, taking several hours to do as much burning as three minutes of direct summer sun.

Stoker Manufacturers Elect Hoke

CHICAGO — Optimism and enthusiasm prevailed at the 23rd annual meeting of the Stoker Manufacturers Association, held in June at Hot Springs, Va. Officers and members of the Association expressed confidence in the ability of the stoker industry to continue its progressive merchandising and advertising programs in the face of unsettled world conditions and they backed this up by pointing to the increase in sales of stokers for the first four months.

The two-day meeting devoted its attention largely to merchandising and sales programs and problems. However, the progress made within the past year in engineering and development work came in for particular study because of the increasing public interest in home building and construction.

As a feature of the stoker men's annual conference, a clinic on merchandising was conducted by Carl Palmen, merchandising counsellor of Cleveland. One session was devoted to this subject and merchandising and sales methods analyzed from the viewpoint of the stoker manufacturer, distributor, dealer and salesman.

The retiring president, E. C. Sammons, who had served for two years, reported to the convention that the Association had endeavored to study and handle those problems which were of immediate concern to the manufacturers and that definite progress had been made in the past year. He spoke on behalf of the stoker industry in offering the services of the manufacturers, engineers and technicians, to the nation and the national government in the preparations for national defense. Mr. Sammons reported that the Association had completed its standardization work on minimum setting heights and stoker ratings and that the engineering committee is undertaking studies on other phases of standardization that would be reported on at the winter meeting of the Association.

Officers elected for the ensuing year were:

President, Frank Hoke, Indianapolis; vice president, B. O. Fink, Auburn, Ind.; and treasurer, John Munro, Harvey, Ill. These three officers together with Mr. Sammons and C. E. Lewis, Rochester, N. Y., comprise the new executive committee. Marc G. Bluth, Chicago, was re-appointed secretary.

Detroiters Elect George Tuttle

DETROIT—The Michigan chapter of the ASHVE held its annual golf meeting together with election of officers at the Birmingham Golf Club, May 21.

The following officers were elected: President, G. H. Tuttle; vice-president, J. S. Kilner; secretary, W. H. Old, and treasurer, F. R. Bishop.

Govt. to Push Rural Home Building

WASHINGTON—Plans were announced May 29 by M. L. Wilson, director of the extension service in the Department of Agriculture and chairman of the Central Housing Committee on rural housing for a renewed national program of education relative to how existing facilities of governmental financing agencies may be used to promote the building of low-cost homes in rural communities and for farm building repairs and improvements. Important interests in the building industry are cooperating with this program, Mr. Wilson stated.

Under this program an effort will be made to get a wide-spread understanding of the methods of operation of the existing housing agencies, so that those who are anticipating building new low-cost homes in small towns and rural areas and on farms will more readily understand how to use existing agencies in this field. The federal agencies, including the Farm Credit Administration, Federal Home Loan Bank Board, FHA, Federal National Mortgage Association, and the R.F.C. Mortgage Company, are anxious that their services may be used in small town and rural areas. Many types of needed low-cost village homes, farm subsistence homes, farm houses and productive farm buildings can be financed through the existing agencies in these localities or adjacent thereto.

Cooperating with this joint governmental program, the building industry has set up the National Homes Foundation, representing manufacturers, local building material dealers and trade associations in the building and allied fields. This Foundation, membership in which is open to all elements of the building industry interested in the rural building market, with headquarters in Washington, through its technical and educational committees, is recommending techniques to improve building design and construction and at the same time make for lower costs. Through this program the building industries interested in the farm and rural markets are ready with a cooperative merchandising, educational and promotional program to stimulate building and modernization and repair activity in these areas.

MIT Starts Building Engineer Dept.

CAMBRIDGE, MASS.—Establishment of a Department of Building Engineering and Construction is announced by Massachusetts Institute of Technology. It will be under the general supervision of Professor Walter C. Voss, who says:

"The building industry, second only to agriculture, is acutely in need of technically trained leaders who can recognize its shortcomings.

Los Angeles Heating Surveyed

LOS ANGELES—More than 69% of all dwelling units embraced in a recently completed housing survey conducted by the Housing Authority of the City of Los Angeles had no installed heating equipment.

The survey was made for the purpose of determining the need for low-cost housing. The territory involved totaled 90 square miles, or approximately 20% of the city's 440.3 square mile area. Included in the heating facility survey of the entire project (which also embraced plumbing, refrigeration and cooking equipment) were 250,069 dwelling units which were occupied by 676,943 persons. The dwelling units under scrutiny of a staff of several hundred W.P.A. enumerators, represented approximately one-half of the total dwelling units in the city. Predominant type of residential structure investigated was the single family detached residence. There were 125,981 of that type, or more than half of the total. Surveyed also were 2,139 apartment buildings containing 41,548 dwelling units.

Of the total dwelling units covered in the heating survey, 13,458 were found to have central steam or hot water heat; 5,661 had central warm air facilities; 57,093 were equipped with miscellaneous other installed units, such as gas or electric space heaters, or oil or coal burning stoves; and 173,857 dwelling units (69.5%) had no installed heating equipment of any kind. The report of the Housing Commission set forth that considering the survey was made among older type buildings and in so-called "blighted" sections of the city, and in view of the mild climate of Southern California, the great number of dwellings with no heating facilities cannot be regarded as unusual.

A recommendation has been made to the city council that the city of Los Angeles sponsor a supplementary survey covering remaining city areas.

Hartness House Bar Conditioned

SPRINGFIELD, VT.—An unusual feature of the Hartness House, the former residence of Governor Hartness of Vermont, which was converted to an inn and lately has been added to the L. G. Treadway chain of Real New England Inns, is the underground cocktail room and lounge. It is connected with the inn by an air conditioned tunnel, the lounge also being air conditioned by means of a system which was designed by the late Governor Hartness himself. He constructed the tunnel and the underground room to connect the house with a large and now quite famous telescope which he also designed. This saved him a walk of 100 yards in winter snows.

Seattle Electric Rates Dropped

SEATTLE—Effective July 15, new lows in all-electric rates have been made by City Light of Seattle, the large municipally owned utility that plans to popularize complete electric homes and the more widespread use of electric water heaters.

Superintendent E. R. Hoffman has already found that advance notice of the new residential rate reductions for electric current has precipitated a demand for automatic electric storage tank heaters.

Through the new rate slash, Seattle is provided with the lowest residential current cost per kilowatt hour of any city of more than 150,000 population. Two other Northwest cities are lower—Tacoma, Wash., and Eugene, Ore., but these have much less population.

Unprecedented is Seattle's new all-electric rate, which gives 370 kilowatt hours per month for $5, with each additional kilowatt hour at the new low of 7 mills per k.w.h. The rate applies to homes using the electric range as well as the storage tank type electric heater, which has grown enormously in popularity, and is expected, moreover, to result in a more widespread demand for modern electric heating equipment.

Urges State to Ease Dust Code Rules

BUFFALO — At a hearing here concerned with code provisions to provide for control of injurious industrial dusts, B. T. Hain, manager of a local foundry, urged "extreme caution" on the part of the state in forcing foundries at this time to make extensive changes in health and safety equipment.

Because of the possibility of interference with war work, Mr. Hain said such action would not be advisable at this time. Referring to war prospects, Mr. Hain asserted: "It is quite likely that most of us will be tied up with making a lot of other studies, maybe in preparation for doing some other sort of work that we hope we won't have to do, but may have to."

Recommendations for modification of certain items in the proposed code were offered by James R. Allan of Chicago, chairman of the National Committee on Industrial Codes, American Foundrymen's Association, and Elliott Armstrong of Buffalo, executive secretary of the Inter-Allied Foundries of New York State.

Erie City Iron Works 100 Years Old

ERIE, PA.—The Erie City Iron Works, builders of boilers and steam power plants, is celebrating its 100th year in business. The company was started by Bethuel Boyd Vincent in 1840.

ACMA and RMA Combined July 1

WASHINGTON—The Air Conditioning Manufacturers' Association and the Refrigerating Machinery Association, two leading trade Associations of manufacturers in the air conditioning and refrigeration industries, combined their activities as of July 1. The new Association is known as the Air Conditioning and Refrigerating Machinery Association.

Primary result of the combination, according to an Association statement, will be a broadened scope of operations, with particular attention being given to equipment standardization in the commercial refrigeration and air conditioning fields.

Officers of the new Association are: President. S. E. Lauer, York Ice Machinery Corp.; first vice-president, S. M. Crocker, General Electric Co.; second vice-president, E. T. Murphy, Carrier Corp., and treasurer, P. A. McKittrick, Parks-Cramer Co.

In addition to the officers, the following constitute the board of directors of the Air Conditioning and Refrigerating Machinery Association: W. H. Aubrey, Frick Company, Incorp.; H. Bissell Carey, The Automatic Refrigerating Co.; P. Y. Danley, Westinghouse Electric and Manufacturing Co.; J. M. Fernald, Baker Ice Machine Co., Incorp.; F. T. Goes, The Vilter Manufacturing Co.; G. A. Heuser, Henry Vogt Machine Co.; Lee Nusbaum, Pennsylvania Engineering Co.; H. R. Sewell, B. F. Sturtevant Co.; C. W. Vollmann, Linde Canadian Refrigeration Co., Ltd.; G. E. Wallis, The Creamery Package Manufacturing Co., and Charles E. Wilson, Worthington Pump and Machinery Corp.

William B. Henderson, who has served as executive vice-president of both RMA and ACMA for the past six years, will be the executive officer of the Air Conditioning and Refrigerating Machinery Association, with offices in the Southern Building, Washington.

Defense Housing Group Named

CHICAGO—The National Association of Housing Officials announced June 23 appointment of a special committee to advise local public agencies and the Federal Government on emergency housing connected with defense plans. The committee was set up, the association said, in the belief that the low-cost housing program would have to be fitted into the building of accommodations for expanded defense industry towns and Army and Navy post communities. Named chairman of the committee was C. F. Palmer, chairman of the Atlanta Housing Authority and president of the association. Other members include Edward Weinfeld, State Housing Commissioner, New York.

Engineers Mobilize for Defense

NEW YORK — Mobilization of the engineering and architectural professions for national defense is under way now with the preparation by their professional organizations of a nation-wide census of 115,000 engineers and architects skilled in the design and supervision of all types of construction needed in case of national emergency.

Cooperating with the American Society of Civil Engineers and the American Institute of Architects in this national movement are the following engineering organizations and their presidents: The American Institute of Mining and Metallurgical Engineers; The American Society of Mechanical Engineers; American Institute of Electrical Engineers; American Institute of Chemical Engineers; American Institute of Consulting Engineers; American Society of Heating and Ventilating Engineers; American Society of Military Engineers; American Society of Refrigerating Engineers; and the National Society of Professional Engineers.

The first step of the census, just started, is the listing of engineering and architectural firms, partnerships, and individuals in private practice. This is being accomplished by the cooperating national engineering and architectural organizations through special committees in each of their local sections and chapters, which are located in almost every city of the nation and, thus, in a position to provide nearly one hundred percent coverage. The second step will consist in indexing and classifying each firm or individual according to qualifications so as to permit of ready selection of those best fitted to undertake in any part of the country whatever type of construction would be necessary in the interests of national defense. The final step will be similar to the first two in all details except that, instead of firms, there will be listed and classified architects, engineers, draftsmen, surveyors, and specialists, who may be available to work with firms assigned jobs to design and supervise.

Automatic Heat for New Homes

BUFFALO—The Buffalo Oil Burner Association held its final meeting of the season June 6 at the Little White House in Williamsville, N. Y. The evening was devoted largely to social activities. President Fred Kendall, presided.

William H. Heckert, public relations chairman for the association, declared that "Ninety-five per cent of the new homes being built here have automatic heat and 40% of the new industrial and commercial buildings are burning oil," he asserted.

Granary Ventilation Need Stressed

BUFFALO, N. Y.—The vital need for explosion venting in the construction of new milling and grain properties as a means of reducing the blast hazard was stressed by G. W. Gustafson of Chicago, chief engineer of the Mills Mutual Fire Prevention Bureau, in an address before the 45th annual convention of the Association of Operative Millers here.

"Unfortunately," he said, "in many destructive explosions the exact cause of ignition is never determined because eyewitnesses are killed or seriously injured. One authority has established that one cubic foot of grain dust suspended in air in proper proportions, will, when ignited, exert a force equal to that produced by the explosion of 86 pounds of dynamite.

"Every effort should be made to prevent entrance of foreign materials such as iron, steel or stone into the house from the unloading sinks.

"From a study of explosions it has been found that the reason for such extreme damage in many cases was due to lack of relief for the pressure developed. Lack of sufficient window area for both ventilation and pressure relief results in heavy concrete walls being shattered. With sufficient window area, relief is provided when windows are blown out or opened without damage to the structure itself."

Abbot Gets Patent on Sun Boiler

WASHINGTON—A solar flash steam boiler has been patented by Dr. Charles G. Abbot, secretary of the Smithsonian Institution here. Dr. Abbot is a world-famous authority on solar radiation.

A feature of Dr. Abbot's new sun-operated steam generator is that it provides steam at a constant pressure regardless of the variations in the strength of the sun's rays. Thus, at times when the sun is not so bright the pressure of steam generated would be the same as in a bright sun.

The sun's rays are focused on a boiler which comprises a long metallic tube. This tube is surrounded by a double-walled glass insulating jacket that is transparent to the sun's rays but opaque to the longer heat rays.

Water is injected into the boiler at a rate automatically controlled by the steam generated by the solar boiler itself. The sun's rays, which are focused on the boiler by concave semi-cylindrical mirrors, instantly raise the temperature of the injected water above its boiling point so that steam is immediately formed.

Some of the steam goes to a chest where the pressure controls a valve so that water is fed to the boiler only in amounts that can be instantaneously converted into steam.

Low Air Temperatures Desirable for Winter Heat, Yaglou Reports

NEW YORK—The importance of providing equipment in buildings to keep them healthfully warm in winter and cool in summer was stressed by Prof. C. P. Yaglou of Harvard University, at the annual convention of Building Owners and Managers here in June.

Factors that should be considered, Prof. Yaglou said, were proper insulation, the differences in the amount of clothing worn by men and women, and natural ventilation.

The best heating system, in his opinion, is that which will produce comfort at the lowest possible air temperature so as to alleviate contrasts between the inside and outside temperatures.

"If the outside walls have little insulation," he explained, "rooms with two or three exposures may have to be heated between 75 and 80F in order to compensate for the cold walls and glass. It is in such rooms that people catch colds, because floors are cold and drafty, while the breathing ozone is too warm."

New England Air Conditioning Institute Meets

(Concluded from page 61)

manent situation. The fluorescents are more efficient, and the history of lighting shows that every time there has been an important rise in the efficiency of lamps, consumers have used more and more light. The drop in wattage, therefore, is a temporary condition which applies principally to the smaller consumers who for economic reasons must pay a higher price for the current. For the larger users fluorescent lighting more frequently represents an addition to existing loads.

Professor W. F. Wells, director of Laboratories for the Study of Air-borne Infection, University of Pennsylvania School of Medicine, gave another of his interesting talks on that subject, introducing much information relative to the effect of the ultra-violet ray on bacteria.

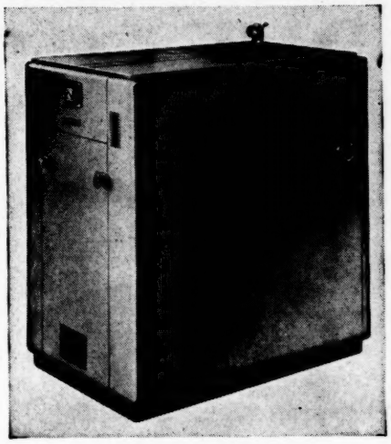
Herman Seid, New York attorney, specializing in air conditioning practice, outlined briefly the most recent developments in air conditioning, as disclosed by a study of patent applications at the United States Patent Office, and gave a brief resume of the latest laws and regulations regarding the life and use of patents. Owing to limited time he could only touch the high spots of patent developments, saying that air conditioning was not yet well classified in the Patent Office, although $20,000 had been appropriated for the purpose of thoroughly classifying and indexing patents and applications in this field. Both are entered in various places, ranging from locomotives to toys, he said. There are many foreign patents listed, particularly for absorption and adsorption equipment, including one by a Japanese for a complete system. Ordinarily Japanese have been considered imitators rather than originators, he said, but this particular development showed careful thought and long study.

Use of extruding fins out of tubes, and the improved spacing of fins and tubes have also caused remarkable efficiency in operation of some types, especially steam ejector systems. There has also been improved fan engineering, while air cleaning has made big strides. There have been many patents for small package units, and there are also some for the chemical treatment of wood fiber filters or cleaners, with deodorizing agents. Precipitators, he said, are in a state of flux. In absorbers, control of the dew point has been an important development. He mentioned a French absorber system using briquettes with a deodorizer. Control of temperature at the point of distribution was another development noted in patents. Others were humidifiers with electrical chargers on the water and on the article or product to be humidified, such as tobacco; room coolers—condensate disposal; control of refrigeration temperatures and amounts of refrigerants; differential controls by which temperatures are kept within certain limits, creating a zone; zone controls, in which he noted one Japanese patent application; local recirculation controls; ducts, with two developments, one of which, a Danish patent, is of streamlined design, with no visible seams; and the second is small ducts with a high pressure air stream; improvements in both single and multiple coils.

High spots for the public, he noted, include storage systems for railroad cars and industrial plants for storing water at comparatively low temperatures and coil systems to build up ice for later cooling use; humidified anaesthetics to avoid explosions and to assist the patient, of which there are several systems patented or on application; and air at high pressure from central systems.

In a talk on "Electric Motors for Air Conditioning," G. T. Arnold of Boston Edison Company gave an elementary but very interesting discussion of essential differences among the different types of D.C. and A.C. motors, pointing out the applications of the different types of motors for various air conditioning purposes.

NEW EQUIPMENT



Crane No. 16 boiler

Crane Boiler Burner Unit

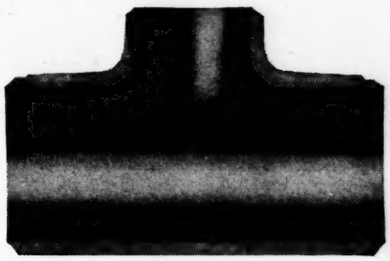
NAME—Crane No. 16 Sustained Heat boiler burner unit.
PURPOSE—For supplying steam or hot water using oil as a fuel.
FEATURES—This unit combines both boiler and oil burner and is designed exclusively for the combustion of oil. It differs from the conventional in its down draft flue construction with tapered flue ways. This "Sustained Heat" principle is said to be an exclusive Crane patented feature and is said to greatly increase the efficiency of the boiler. Entire unit is enclosed in an insulated metal jacket.
MADE BY—*Crane Co., 836 S. Michigan Ave., Chicago, Ill.*

Torrington Blower Wheel

NAME—Airotor blower wheel.
PURPOSE — A simplified, low price blower wheel.
FEATURES—Manufacturer states that this blower wheel has only four parts including the hub and that neither welds nor rivets are used in its assembly. This four piece construction is said to make it possible to supply the wheel at a much lower price than heretofore possible and to give the wheel greatly increased rigidity and efficiency. Features include, concentric rib serving as backing for blade strip formed at same time as hub socket to insure maximum degree of concentricity. Hub fitted and fastened securely to a cone shaped socket to insure concentricity, and rigidity. Deep formed concentric rib which insures trueness of wheel—this rib bears against the end of blades to minimize cantilever blade deflection. Deep formed radial ribs blending into hub socket, thereby stiffening back of wheel and resisting deflection by thrust against hub. Three thickness of metal making for a maximum strength.
SIZES AVAILABLE—Sizes already in production, single widths 4½, 5, and 6 inches diameter and 3⅝, 12½, and 16½ diameters in double width. Wheels will soon be available in all sizes to 20 inches in diameter in both single and double widths.
MADE BY—*Torrington Manufacturing Company, Torrington, Conn.*

Tube-Turns Welding Tee

NAME—Tube-Turns Tee.
PURPOSE — Seamless steel tees for welded pipe lines.
FEATURES—Outstanding feature of this new tee is said to be that the full pipe strength is obtained through the placing of metal at the points of higher stress rather than by excessive thickness throughout which results in much useless weight. Tee is said to have considerable metal thickness at the crotch and this thickness is gradually reduced to a nominal at the bottom of the tee where stresses again reach normal. The tee also is said to have longer outlets which provides for greater ease in lining up and welding.
MADE BY—*Tube-Turns, Inc., 237 E. Broadway, Louisville, Ky.*



Seamless steel welding tee

Armstrong Steam Traps

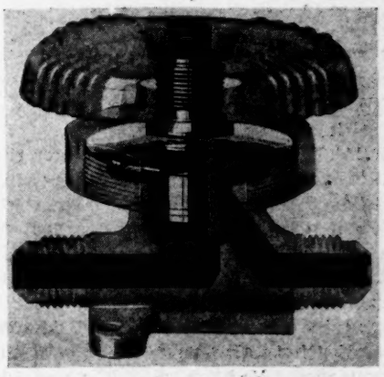
NAME—Armstrong steam traps, No. 800 and No. 801.
PURPOSE—For removing air and condensate from steam lines.
FEATURES — These traps supersede the small 200 series traps formerly produced by the company. Features are said to include more rugged construction with more metal added at connecting points and around water passages, freer flow of water, one-piece stainless steel bucket, and single casting size for both ½ in. and ¾ in. pipe connections. No. 800 trap is for use on straight through pipe connections. Either trap may be equipped for "blast" trap service using buckets which have an auxiliary thermic air vent. When thus equipped, these traps are said to be capable of handling from 50 to 100 times as much air as regular traps. Both traps have the inverted bucket operating principle.
MADE BY—*Armstrong Machine Works, Three Rivers, Mich.*

Williams-Wallace Flue Pipe

NAME—Metalbestos gas vent and flue pipe.
PURPOSE—For venting gas fired appliances.
FEATURES—Metalbestos is said to be made of two pipes, an inner pipe of pure aluminum and an outer pipe of galvanized steel. Between the two pipes there is a half-inch air space. Manufacturer claims that this construction results in a pipe that is efficient because it maintains the temperature of the exhaust gases high enough to carry them to the outer air without condensing, that it is safe because it disposes of the products of combustion without allowing them to permeate the chamber where the appliance is situated and that it is durable in construction because the aluminum inner pipe is impervious to sulphurous and sulphuric acids which form the condensate of combustion. Pipe is made in both round and oval shapes and a complete line of fittings is available.
SIZES AVAILABLE — Eight sizes round pipe with inner diameters from 3 to 12 in. and four sizes oval pipe, diameters 3 to 6 in.
LITERATURE AVAILABLE—Catalog 339A.
MADE BY—*Williams-Wallace Co., 160 Hooper St., San Francisco, Cal.*

Weatherhead Packless Valve

NAME—Weatherhead packless valve.
PURPOSE—For controlling the flow of refrigerants.
FEATURES—Features claimed include the following: low overall height, full capacity openings to provide a complete flow of refrigerant, fracture proof and leak proof construction using a beryllium copper diaphragm, and an oval grip handwheel for easy operation.
MADE BY — *The Weatherhead Co., Cleveland, Ohio.*



For controlling refrigerant flow

Tuttle & Bailey Copper Convectors

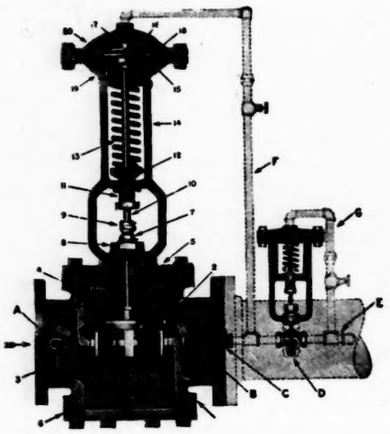
NAME—Tuttle & Bailey copper convectors.
PURPOSE—For room heating using either hot water or steam.
FEATURES — Convector element is made entirely of copper and the copper tube is said to be designed to combine minimum resistance to air flow with maximum contact with fins and ample capacity for the heating medium. Contact between the fins and tubes are by metallic bond. For controlling the capacity of convectors, a damper is provided which can be operated through the bottom opening of the enclosure. Dampers are packed as complete units and can be applied on the job or in the distributor's warehouse. Both convectors and heating element are packed in cartons to prevent damage during shipping.
MADE BY—*Tuttle & Bailey, Incorporated, New Britain, Conn.*

Grayson Automatic Pilot

NAME—Grayson thermo-magnetic automatic pilot.
PURPOSE—For shutting off gas flow in case of flame failure.
FEATURES—An electric thermocouple mounted in the gas pilot flame and is used to produce a small electric current which in turn operates an electric magnet. Under normal operation the electric current is used to hold open the magnet valve. Upon failure of pilot flame, the hot junction closes and ceases to produce electric energy which results in the electric magnet weakening so that the valve spring can close the safety pilot valve. An interruption with any part of this system whether it be pilot failure, or failure of mishandling, or failure through breaking the thermocouple lead, will result in shutting off all the gas to the main burner.
MADE BY—*Grayson Heat Control Ltd., 3000 Imperial Highway, Lynwood, Calif.*

McAlear Pressure Regulator

NAME — McAlear pressure reducing regulator No. 231.
PURPOSE—For reducing and controlling steam pressures.
FEATURES—Manufacturer states that this valve is an auxiliary operated valve of single seated construction. When employed for the control of steam, it is frequently used as a primary control valve, and a secondary valve of the weighted lever type is used in conjunction with it. Similar applications also permit the pressure by stages. Main valve of the radiator comes in either direct seated (spring

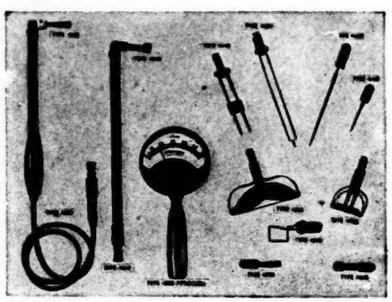


For controlling steam pressures

opened) or reverse seated (spring closed) as desired. The main valve when direct seated is held open by spring tension and closed by inlet pressure by the diaphragm. The pilot valve is installed in the bleed-off connection of the main valve diaphragm with a line from the reduced pressure side connected to the pilot valve diaphragm. A slight fluctuation in the reduced pressure causes the pilot valve to open or close, thus varying the pressure on the main diaphragm and in turn maintaining the pressure for which the valve is set.
MADE BY—*McAlear Mfg. Co., 1901 S. Western Ave., Chicago, Ill.*

Illinois Surface Pyrometer

NAME—Alnor Surface Pyrocon, type 4000.
PURPOSE—A portable pyrometer for measuring surface temperatures.
FEATURES—Instrument incorporates a number of new features including the following: heavy rugged movement, choice of either rigid or flexible arms or both which are instantly removable or interchangeable, instant interchangeability of different thermocouples, choice of seven standard temperature ranges, and greater accuracy.
LITERATURE AVAILABLE—Bulletin 3511.
MADE BY—*Illinois Testing Laboratories, Inc., 420 N. La Salle St., Chicago, Ill.*



For measuring surface temperatures

M-H Room Humid-U-Stat

NAME — M-H Room Humid-U-Stat H0900.
PURPOSE—For controlling the humidity of air.
FEATURES—This is a pneumatic hair element humidity controller designed for wall mounting. It is equipped with a temperature compensator which is said to maintain calibration so that it will control at the selected relativity even though the temperature changes. Device may be used either as a direct or reverse acting control by a simple adjustment. Also the throttling range may be adjusted on the job to prevent the wide variation in humidity which sometimes results from controls "hunting." Available in the scale range of 20 to 80% R.H. and with a throttling range from 2 to 30% R.H. Instrument is finished in silver bronze.
MADE BY — *Minneapolis-Honeywell Regulator Company, 2950 Fourth Avenue South, Minneapolis, Minn.*

Barnes & Jones Trap Element

NAME—B & J replaceable trap unit.
PURPOSE—A thermostatic operating unit for repairing thermostatic traps.
FEATURES—The trap unit consists of a thermostatic element stainless steel valve seat and plug, locked in correct adjustment for proper opening and closing temperatures. This feature is said to eliminate the need for threading the element into the trap cover or for making adjustments between the valve seat and valve piece. Manufacturer states that it is possible to repair practically all makes of thermostatic traps without special tools or adjustments.
MADE BY—*Barnes & Jones, Inc., 200 Brookside Ave., Boston, Mass.*

White-Rodgers Thermostat

NAME—Line voltage thermostat, type 176.
PURPOSE—For regulating room temperatures.
FEATURES—This thermostat incorporates an adjustable stop to limit the maximum temperatures at which it may be set. This maximum temperature may be adjusted only by removing the instrument from the wall. Manufacturer states that such a device makes it possible for the building owner to control the maximum room temperature. This thermostat also has a setting for summer operation which makes it possible to operate the fan on warm air systems during the summer without disturbing the winter temperature stop.
MADE BY—*White-Rodgers Electric Company, 1209 Cass Avenue, St. Louis, Mo.*

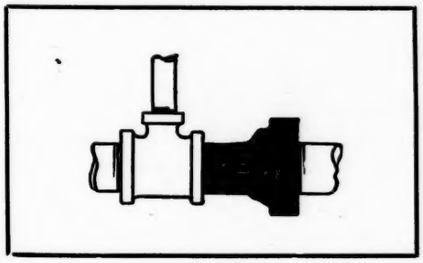
Low cost replaceable filter

Walton Replaceable Filter

NAME—Walton WA Filter.
PURPOSE—To provide a replaceable filter at a low cost where frequent changes of filters are necessary.
FEATURES—Snap-in wire grids fit permanently into standard bank frames and hold in place the Walton filter element. First costs are said to be lower than common throw away filters and replacement costs are cut over 30%. Only the filter element is replaced when dirty. No frames are thrown away as the grids remain a part of the frame, although removable.
MADE BY—*Research Products Corporation, Madison, Wis.*

Sullivan Hot Water Fitting

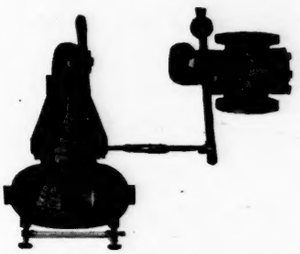
NAME—Sullivan Positive Distributing Fitting.
PURPOSE—For providing an adjustable water volume control for individual radiators on one-pipe hot water heating systems.
FEATURES—Fitting consists of a brass casting in which a friction grip baffle plate is mounted. Adjustment and water flow is made by releasing a set screw and turning an adjusting cap which sets the baffle in any desired position. Manufacturer claims that this valve enables each radiator to be set with the same temperature drop and that the valve can be accurately adjusted for correct water flow. The fitting is installed in connection with a reducing T leading to each radiator for single pipe jobs and can also be used on a return connection to radiators for balancing two pipe jobs either gravity or forced circulation.
MADE BY—*Sullivan Valve & Engineering Company, 910 S. Arizona St., Butte, Montana.*



For controlling water flow to radiators

McAlear Liquid Level Controller

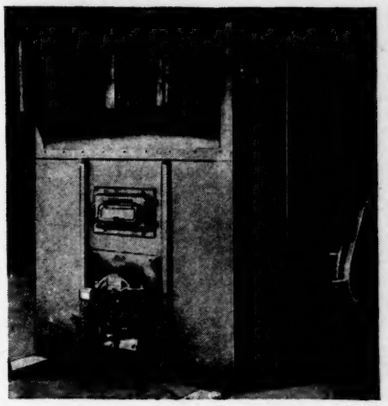
NAME—Liquid Level Controller No. 823.
PURPOSE—For control of fluid levels in storage or process tanks, feed water heaters, condensers and similar liquid containers.
FEATURES—Device is a ball bearing liquid level controller with balanced lever valve for controlling fluid level. According to the manufacturer, it may also be used as a continuous drainer to handle large volumes of condensate from vessels. A mercury switch may be added to the control when desired to ring an alarm bell when the level reaches a dangerous point or to operate various colored lights to indicate high, normal or low level. Controller and valve are made for a maximum working pressure of 600 lb. at 750F. The valve comes in sizes up to 8 in. inclusive.
MADE BY—*McAlear Mfg. Co., 1901 S. Western Ave., Chicago, Ill.*



For liquid level control

Airtherm Oil Fired Unit Heater

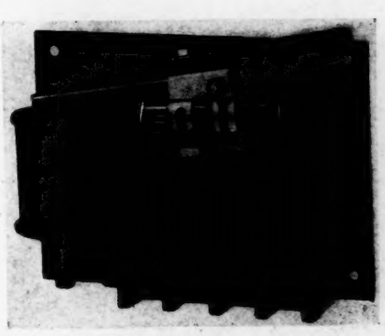
NAME—Directherm unit heater.
PURPOSE—For supplying large quantities of warm air using oil as fuel.
FEATURES—These units have been developed to supply large quantities of warmed air to large buildings such as airplane hangars, garages, warehouses, as well as to isolated buildings to which it is impractical to pipe steam. They also can be used for partial heating of buildings where the cost of central steam plant would be prohibitive. The unit is a self-contained heating system consisting of an oil burner, heat transfer surface and a centrifugal fan for distributing the warm air. Manufacturer states that this heater can be set up for full automatic control both for room temperature and delivery temperature. Units are also available for coal and gas firing.
SIZES—Oil fired unit in six standard sizes from 300,000 to 1,500,000 B.t.u. per hour.
LITERATURE AVAILABLE—Bulletin No. 2-I.
MADE BY—*Airtherm Mfg. Company, 720 So. Spring St., St. Louis, Mo.*



For large volume heating

Mercoid Relay

NAME—Mercoid relay, type W-6.
PURPOSE—For the control of motors, valves, electrical heaters and similar equipment.
FEATURES—Relay is designed for panel mounting and is recommended for many industrial applications. In operation a plunger type solenoid is used to actuate a tilting arm to which the Mercoid hermetically sealed mercury contact switch is attached. When the coil is energized, the plunger floats within the plunger guide tube which is said to reduce the noise of the alternating current vibrations. There are no metal contacting armature faces. Opening of the pilot circuit or current failure causes plunger to drop by gravity and it is claimed that the contact can not be held closed by residual magnetism. Available for any voltage or cycle between 6 volts and 230 volts, A.C. or D.C.
MADE BY—*The Mercoid Corporation, 4203 Belmont Ave., Chicago, Ill.*



Mercoid relay, type W-6

Degree-Day Figures for May, 1940

HEATING & VENTILATING continues its twelfth year of publishing degree-day data for various large cities

	Albany, N. Y.	Atlanta, Ga.	Baltimore, Md.	Birmingham, Ala.	Boston, Mass.	Buffalo, N. Y.	Burlington, Vt.
Degree-days for May, 1940	218	58	95	42	269	370	284
Degree-days, Sept. 1, '39 to May 31, '40	7632	3614	4836	3219	6382	7276	8400
Degree-days, Sept. 1, '38 to May 31, '39	6965	2594	4043	2249	5922	6655	7945
Degree-days, Sept. 1, to May 31, Normal	6580	2890	4533	2352	6045	6810	7511

	Cheyenne, Wyo.	Chicago, Ill.	Cincinnati, Ohio	Cleveland, Ohio	Columbus, Ohio	Denver, Colo.	Des Moines, Iowa
Degree-days for May, 1940	344	361	203	303	224	190	200
Degree-days, Sept. 1, '39 to May 31, '40	6781	6548	5568	6461	5919	5275	6604
Degree-days, Sept. 1, '38 to May 31, '39	7173	5808	4537	5472	4952	5609	5841
Degree-days, Sept. 1, to May 31, Normal	7340	6290	4703	6155	5398	5874	6384

	Detroit, Mich.	Dodge City, Kan.	Duluth, Minn.	El Paso, Tex.	Erie, Pa.	Evansville, Ind.	Fort Wayne, Ind.
Degree-days for May, 1940	301	86	533	5	293	128	275
Degree-days, Sept. 1, '39 to May 31, '40	6907	5053	8875	2382	6726	4980	6676
Degree-days, Sept. 1, '38 to May 31, '39	6220	4580	9240	2504	5860	3918	5711
Degree-days, Sept. 1, to May 31, Normal	6490	5035	9245	2428	6273	4244	5925

	Fort Worth, Tex.	Grand Rapids, Mich.	Green Bay, Wis.	Harrisburg, Pa.	Hartford, Conn.	Indianapolis, Ind.	Ithaca, N. Y.
Degree-days for May, 1940	4	305	386	143	221	216	237
Degree-days, Sept. 1, '39 to May 31, '40	2527	6750	7692	5795	6654	5842	7146
Degree-days, Sept. 1, '38 to May 31, '39	2168	6106	7345	5125	5863	4848	6458
Degree-days, Sept. 1, to May 31, Normal	2148	6535	7825	5375	6036	5298	6719

	Kansas City, Mo.	Knoxville, Tenn.	La Crosse, Wis.	Lansing, Mich.	Lincoln, Neb.	Little Rock, Ark.	Los Angeles, Calif.
Degree-days for May, 1940	100	88	252	327	156	31	29
Degree-days, Sept. 1, '39 to May 31, '40	5369	4167	7297	7267	6232	3517	728
Degree-days, Sept. 1, '38 to May 31, '39	4474	3286	6875	6608	5296	2789	1263
Degree-days, Sept. 1, to May 31, Normal	4852	3670	7322	7048	5999	2811	1504

	Louisville, Ky.	Madison, Wis.	Memphis, Tenn.	Milwaukee, Wis.	Minneapolis, Minn.	Nashville, Tenn.	New Haven, Conn.
Degree-days for May, 1940	159	331	36	396	298	95	213
Degree-days, Sept. 1, '39 to May 31, '40	5074	7404	3660	7009	8008	4221	6205
Degree-days, Sept. 1, '38 to May 31, '39	4009	6814	2761	6453	7714	3225	5567
Degree-days, Sept. 1, to May 31, Normal	4180	7429	2950	7206	7850	3507	5895

	New Orleans, La.	New York, N. Y.	Norfolk, Va.	Oklahoma, City, Okla.	Omaha, Neb.	Peoria, Ill.	Philadelphia, Pa.
Degree-days for May, 1940	0	179	66	19	161	217	122
Degree-days, Sept. 1, '39 to May 31, '40	1594	5710	3852	3749	6501	6242	5297
Degree-days, Sept. 1, '38 to May 31, '39	1008	4905	2878	3271	5597	5477	4528
Degree-days, Sept. 1, to May 31, Normal	1024	5347	3350	3613	6131	6109	4855

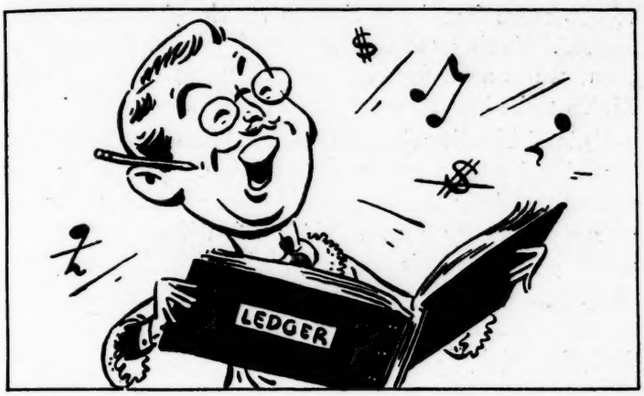
	Pittsburgh, Pa.	Portland, Me.	Portland, Oreg.	Providence, R. I.	Reading, Pa.	Reno, Nev.	Richmond, Va.
Degree-days for May, 1940	182	389	112	262	141	127	78
Degree-days, Sept. 1, '39 to May 31, '40	5788	7315	3395	6341	5671	4581	4457
Degree-days, Sept. 1, '38 to May 31, '39	4863	6929	3789	5698	4957	5104	3516
Degree-days, Sept. 1, to May 31, Normal	5235	6973	4379	6015	5389	5802	3727

	Rochester, N. Y.	St. Louis, Mo.	Salt Lake City, Utah	San Francisco, Calif.	Scranton, Pa.	Seattle, Wash.	Spokane, Wash.
Degree-days for May, 1940	243	111	49	213	205	147	166
Degree-days, Sept. 1, '39 to May 31, '40	7075	5091	4543	2006	6709	3479	5377
Degree-days, Sept. 1, '38 to May 31, '39	6433	4134	5325	2549	5901	4084	5703
Degree-days, Sept. 1, to May 31, Normal	6732	4585	5555	2681	6129	4715	6274

	Springfield, Ill.	Syracuse, N. Y.	Toledo, Ohio	Trenton, N. J.	Utica, N. Y.	Washington, D. C.	Wichita, Kan.
Degree-days for May, 1940	158	237	281	149	224	95	67
Degree-days, Sept. 1, '39 to May 31, '40	5724	7215	5780	5767	7778	4941	4886
Degree-days, Sept. 1, '38 to May 31, '39	4874	6409	5855	4982	7028	4098	4217
Degree-days, Sept. 1, to May 31, Normal	5373	6881	6077	4933	6796	4626	4673

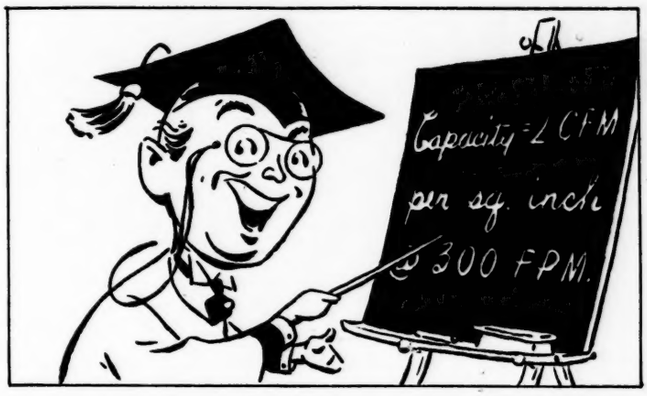
Methods of applying the degree-day in connection with the operation of heating plants or for the prediction of fuel consumption of heating plants are described fully in the new enlarged edition of the DEGREE-DAY HANDBOOK, published by HEATING & VENTILATING, 148 Lafayette Street, New York, price $3. Degree-days as given above for a "normal" month or season are based on averages for a long period of years, ending about 1922. Averages covering different periods will disagree with the above figures slightly.

Reading time: 58 seconds. And worth it!

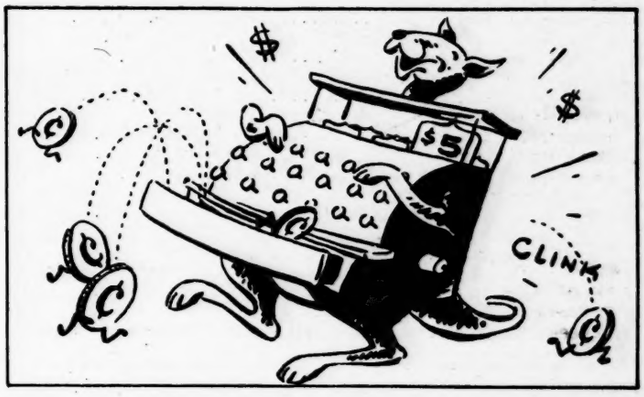


1 The treasurer's praises will be music to your ears, when you change to Dust-Stop* Air Filters in your air-conditioning installation. Cost: Approximately 1-cent per CFM to install, including frames; about 1/10th-cent per CFM, when filters need changing.

2 You couldn't be safer with an old maid than you are with Dust-Stops. The all-glass filtering medium is Fiberglas.* It is coated with a patented adhesive. Neither will support combustion. The old maid won't either.

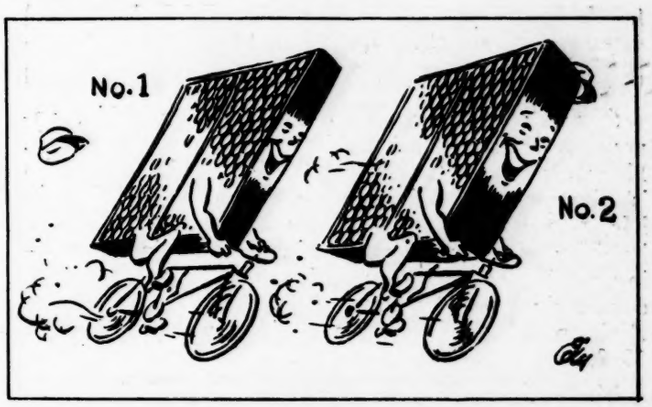


3 Look at these efficiency equations, please. Capacity: 2 CFM per square inch of area at 300 FPM. Resistance: (in inches of water gauge per inch of depth) .045 to .050 clean, and .11 to .12 dirty. These filters stop virtually all "nuisance" dusts, including most hay fever pollen.



4 Changing a five dollar bill couldn't be easier, or require less skilled labor, than changing Dust-Stops. This replaceable filter eliminates cleaning, recharging, draining, expert supervision and the need to keep a supply of spares. Dust-Stops fit all types of air handling systems.

5 Does a turnip bleed? Neither do Dust-Stops! The dust-catching adhesive on these filters will not deposit tiny droplets in the ducts or on the walls. Naturally, a fire-hazard from the adhesive in the duct system just doesn't exist.



6 Dust-Stops come promptly when you order them. No waiting. Your air-conditioning manufacturer, jobber or dealer has a supply of No. 1 (1-inch) and No. 2 (2-inch) always on hand. Order from them today or write: Owens-Corning Fiberglas Corporation, Toledo, Ohio.

FIBERGLAS* DUSTOP* AIR FILTERS

*T. M. REG. U. S. PAT. OFF.

Made by Owens-Corning Fiberglas Corporation, Toledo, Ohio

DIRECT CANADIAN INQUIRIES TO FIBERGLAS CANADA, LIMITED, OSHAWA, ONTARIO

(Concluded from page 48)

morning the thermostat is calling for heat and these rooms with the windows wide open are dissipating a great deal of the heat delivered through the central heating system. To save fuel by unusual household practices, many customers are unwilling to change their daily routine.

Government Activities

A discussion of apartment houses would not be complete if it made no mention of the part played by governmental agencies in this type of construction. As shown on the accompanying graph, the United States Housing Authority has, up to this spring, either provided, or is providing, housing for 150,000 families in its slum clearance program. Of these, 75,000 are either occupied or under construction, with housing for 75,000 more families under loan contract but not yet started. During the remainder of 1940 and in 1941, then, we can probably expect housing contracts for 75,000 to be let and construction begun.

Federal Housing Administration, too, is actively concerned with apartment construction. According to Assistant Administrator Jay Keegan, FHA insured 131 mortgages totaling over $51 million for large scale rental projects. This was 10% of the total amount of new home mortgages insured by FHA.

NUMBER AND CAPACITY OF AIR CONDITIONING INSTALLATIONS IN APARTMENT HOUSES INSTALLED BY OWNERS FOR PROFIT

An excerpt from a report of air conditioning installations released by Edison Electric Institute covering all installations served by 183 electric utility companies in the United States.

Name of Utility	City	Prior to 1938		During 1938		During 1939		Total	
		No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Birmingham Electric Co.	Birmingham, Ala.	1	39	0	0	0	0	1	39
Central Arizona Light & Power Co.	Phoenix, Ariz.	0	0	2	23	2	37	4	60
Central Illinois Electric & Gas Co.	Lincoln, Ill.	1	2½	0	0	0	0	1	2½
Consolidated Edison Co. of New York, Incorporated	New York, N. Y.	2	247½	1	208	0	0	3	455½
Consolidated Gas Electric Light & Power Co. of Baltimore	Baltimore, Md.	1	10	0	0	0	0	1	10
Consumers Power Company	Jackson, Mich.	1	50	1	15	0	0	2	65
Dallas Power & Light Co.	Dallas, Tex.	7	69½	0	0	0	0	7	69½
Florida Power & Light Co.	Miami, Fla.	1	2	0	0	0	0	1	2
Mississippi Power Company	Gulfport, Miss.	1	1½	0	0	0	0	1	1½
The Montana Power Co.	Helena, Mont.	0	0	4	72	3	36	7	108
The Ohio Power Co.	Columbus, Ohio	6	4	1	¾	0	0	7	4¾
Oklahoma Gas & Electric Company	Oklahoma City, Okla.	3	11¾	2	9¾	0	0	5	21½
Pennsylvania Power & Light Company	Allentown, Pa.	0	0	1	20	0	0	1	20
Peoples Light Company	Davenport, Iowa	0	0	0	0	2	11	2	11
Peoples Power Company	Rock Island, Ill.	2	7	1	5½	0	0	3	12½
Philadelphia Electric Co.	Philadelphia, Pa.	1	5½	2	51	0	0	3	56½
Potomac Electric Power Company	Washington, D. C.	0	0	3	438¼	9	727	12	1165¼
San Antonio Public Service Company	San Antonio, Tex.	1	6	1	6	0	0	2	12
San Joaquin Power (Div. of Pacific Gas & Electric Co.)	Fresno, Cal.	0	0	1	10½	1	4¾	2	15¼
Sheridan County Electric Company	Sheridan, Wyo.	3	1½	0	0	0	0	3	1½
Union Electric Co. of Missouri	St. Louis, Mo.	11	226½	2	103¼	0	0	13	329¾

WITH THE MANUFACTURERS

Chrysler Corp., Airtemp Div., Dayton, Ohio, announces that *D. W. Russell* has been selected president. He will take over the duties of *Col. A. C. Downey*, who is taking an extended leave of absence due to ill health. Mr. Russell came to Chrysler Corporation in 1931, bringing with him 18 years of experience in engineering, mechanical and sales fields. Since that time he has done technical and sales work in the company's Fargo Division, of which he was made a vice-president in 1932.

W. B. Connor Engineering Corp., New York, N. Y., has appointed *James E. Orr* as advertising manager of its Dorex division, manufacturers of industrial, commercial and home odor removal equipment.

Frick Co., Waynesboro, Pa., announces that *W. H. Aubrey*, vice-president of the Company and sales manager of the ice and refrigerating machinery department, was elected to the board of directors of the Company May 28. Mr. Aubrey, who is a graduate of the Georgia School of Technology, has been with Frick Company nearly twenty-three years, and has been sales manager since 1932.

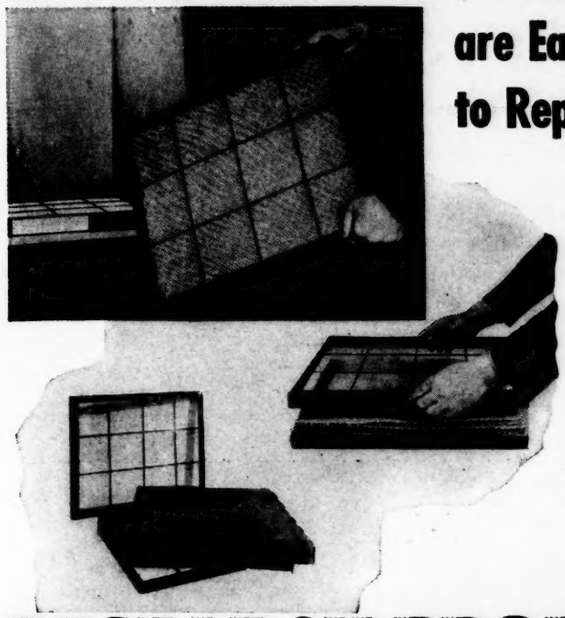
Fischer & Porter Co., Philadelphia, has appointed *Clifford F. Holske* as eastern district manager in charge of sales of Rotameters in New York City and adjacent territory, including northern New Jersey, lower New York state, and western Connecticut. Mr. Holske's headquarters are at 307 Fifth Ave., New York.

General Controls Co., Glendale, Calif., has appointed *E. T. Howard* as general sales manager. He will make his headquarters at the company's general office and plant at Glendale.

Security Manufacturing Co., Kansas City, has appointed *Harry B. Van Hook* as eastern manager with offices at 16911 Snowden Ave., Detroit. Mr. Van Hook has had wide experience with manufacturers of gas heating equipment such as American Radiator Co., A. H. Wolff Gas Radiator Co., and American Gas Products Corp.

Spencer Heater Division, Lycoming Manufacturing Co., Williamsport, Pa., has made two new additions to its sales organization as follows: *Harold F. Becker*, 93-31—207th St., Bellaire, L. I., who will cover the Long Island territory, working out of the New York office. in the Architects Building, 101 Park Avenue; and *Walter I. Higgins*, 619 Linden St., Camden, covering the South Jersey territory and working out of the Spencer Philadelphia office, 31st & Walnut St.

WALTON *Re-Fil-Able* AIR FILTERS



are Easier to Design into Your System... Easier to Replace... Save Your Customers ONE-THIRD

Increase your sales by incorporating the Walton Re-Fil-Able Air Filter in your equipment. Cut filter replacement cost for user by about one-third. Easier to service. Dealers and distributors like it. It's extremely easy to use in any design.

You build into your design our permanent steel frame with a removable cover which contains the filter. To service it merely remove old filter and insert new cartridge. This reduces filter cost about 1/3.

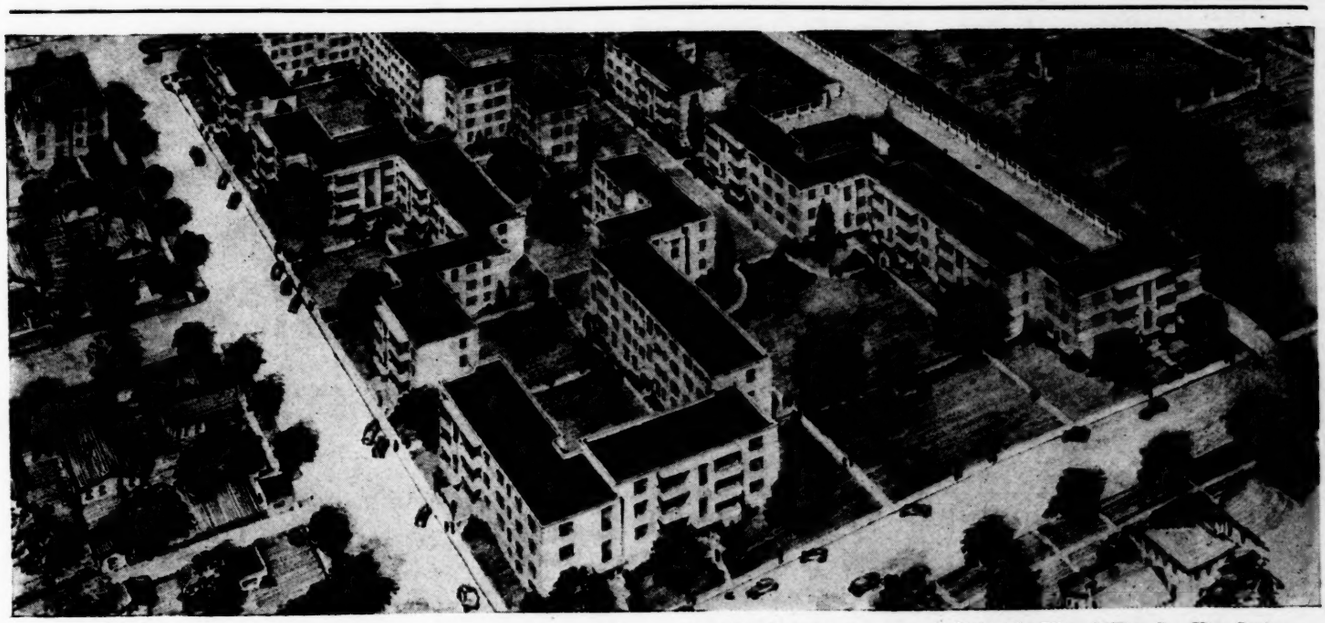
This Re-Fil-Able Walton Filter is the same high quality you have always known . . . long life . . . high dirt removal efficiency and high dirt holding capacity . . . low air resistance . . . no adhesive in air stream . . . fireproofed fibre material . . . odorless. The only difference is the manufacturing economy which you may pass on to the dealer and user. Investigate the possibilities for your line. It makes your equipment better and fully modern and stimulates your sales.

Walton Air Filters are made in various styles and types. The Re-Fil-Able Model shown is Type WR.

RESEARCH PRODUCTS CORPORATION

MADISON WISCONSIN • Manufacturers of--

- **R-P ZEOLITE** — High capacity, long lasting, low cost mineral for softening water.
- **FILTERAG** — An efficient filter medium for filtering water and liquids.
- **ALKALEX** — A carbonaceous cationic exchanger for removing alkalinity from water.
- **BIRM** — The effective, inexpensive mineral for removing iron from water.
- **AIR-FILTERS** — Made of expanded fibre, high dirt removal efficiency, low resistance to air flow.



Fisher, Fisher & Hubbell, Denver Archts. N. G. Petry, Gen. Cont. Van Schaack & Co., Agents. Univ. Pk. Plbg. & Htg. Co., Htg. Cont.

YOUNG STREAMAIRE CONVECTORS TO HEAT NEW HOUSING DEVELOPMENT

Denver's beautiful new Country Club Garden Apartments, a $1,200,000 project, is the first major FHA housing development in the Rocky Mountain states and consists of five buildings containing 187 individual apartments ranging in size from two to five rooms.

Five heating plants employing forced hot water systems are being installed and 949 YOUNG Streamaire convectors will heat all rooms. The selection of STREAMAIRE convectors for this important group project is a distinct tribute to YOUNG engineering and standards of quality.

YOUNG RADIATOR COMPANY

RACINE WISCONSIN

Young Quality

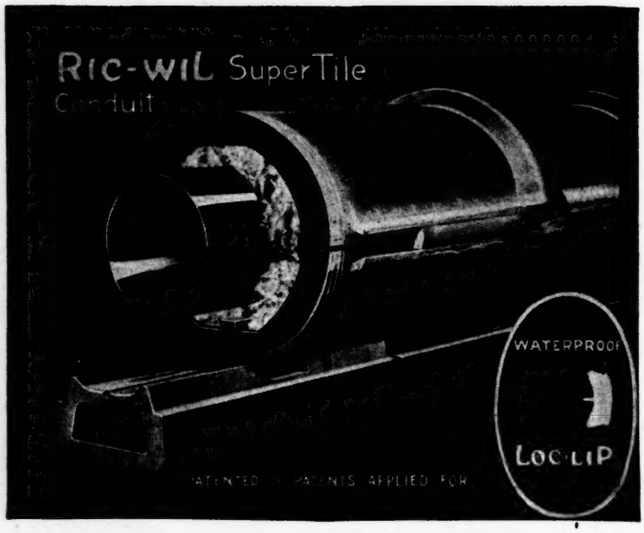
SUPER STRENGTH and SUPER SERVICE STEAM CONDUIT

Buried steam is buried treasure! From leakage, inefficient insulation, or moisture infiltration, you may miss the entire objective of an underground steam system—the EFFICIENT, continuous, economical transmission of steam. From inadequate engineering, unproved construction, or ill chosen materials you may lose at a premature date the underground structure itself—and consequently your entire investment.

30 years' experience have taught Ric-wiL the value of PRE-PROVED types of construction. Ric-wiL has experimented with ITS OWN resources, not with other people's money. Ric-wiL has in successful use 700 miles of underground steam lines all over the country. Let Ric-wiL contribute to YOUR problems the engineering skill which is the result of long experience.

Shown below is Ric-wiL SuperTile design, insulated with Ric-wiL Dry-paC, an extra weight, heavy duty conduit built for safe use under highway traffic, or in especially wide or deep trenches. Ric-wiL offers 6 basic types of underground steam conduit, including Standard Tile, SuperTile, Cast Iron, and Armco Hel-Cor Insulated Pipe Units. These types are available with a variety of approved insulations, either bulk hand-packed or sectional covering. Write for current Bulletins.

The RIC-WIL Co., Union Commerce Bldg., Cleveland, Ohio
New York San Francisco Chicago
Agents in principal cities



REGISTERED IN U. S. PATENT OFFICE
RIC-WIL
CONDUIT SYSTEMS FOR UNDERGROUND STEAM PIPES

SUMMER DEGREE HOURS

For the third successive summer, HEATING & VENTILATING in this and succeeding issues, is publishing monthly and cumulative totals of summer degree hours on an 85F basis. To obtain these figures, hourly temperatures are used and 85 is subtracted from the hourly dry bulb temperature to obtain the number of degree hours for that hour. The total of degree hours for that month gives the monthly figures published on these pages each month during the summer.

There is some indication that in buildings where there is little internal load, either sensible or latent, such as in residences, a simple proportionality between the number of degree hours and the air conditioning load exists.

SUMMER DEGREE HOURS (ABOVE 85F) MAY, 1940

City	Number of Degree Hours, May, 1940	Number of Degree Hours, Summer, 1940, to May 31
Baltimore	40	40
Birmingham	63	63
Bismarck	30	30
Boston	0	0
Buffalo	0	0
Chicago	0	0
Cincinnati	27	27
Cleveland	0	0
Columbus	11	11
Des Moines	32	32
Detroit	0	0
Fort Wayne	0	0
Grand Rapids	2	2
Houston	131	136
Indianapolis	1	1
Kansas City	35	63
Memphis	7	7
Milwaukee	0	0
Minneapolis	3	3
New Orleans	48	55
New York	0	0
Philadelphia	12	12
Pittsburgh	7	7
Portland, Ore.	7	7
Richmond, Va.	66	66
St. Louis	42	50
San Diego	0	67
San Francisco	0	0
Savannah	94	113
Toledo	2	2
Washington	54	54

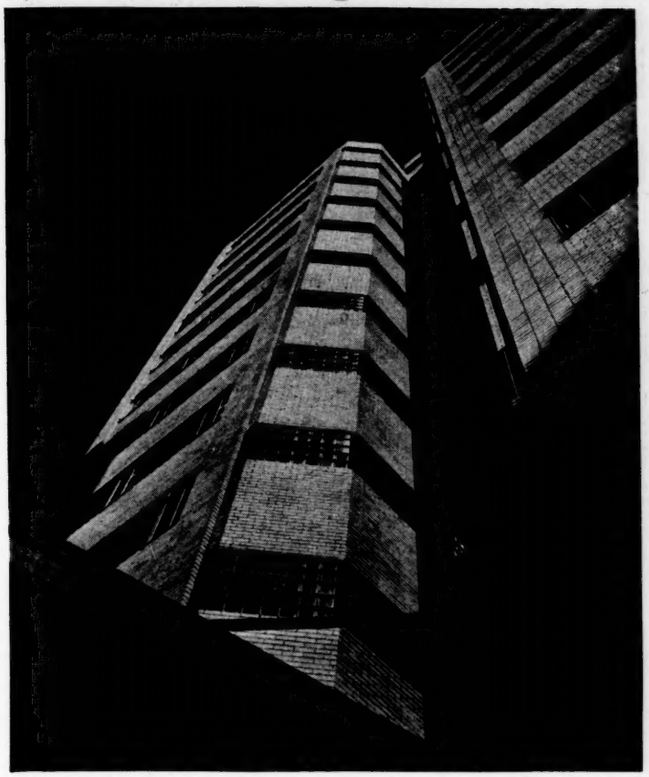
COMING EVENTS

OCTOBER 8-11. The 69th annual meeting of the American Public Health Association, Detroit. Book-Cadillac Hotel, Headquarters.

DECEMBER 2-7. 14th National Exposition of Power & Mechanical Engineering at the Grand Central Palace, New York, N. Y. For information write International Exposition Co., Grand Central Palace, New York, N. Y.

JANUARY 1, 1941. Annual Meeting of the American Society of Heating and Ventilating Engineers to be held at the Hotel Muehlbach, Kansas City, Missouri.

No Rusty Hot Water in These Apartments



New York's First Complete Air Conditioned Apartment House

Architects, Frederick L. Ackerman — Ramsey & Sleeper, Associates; Consulting Engineers, Sullivan A. S. Patorno; General Contractor, Turner Construction Co.; Plumbing Contractor, J. L. Murphy, Inc.

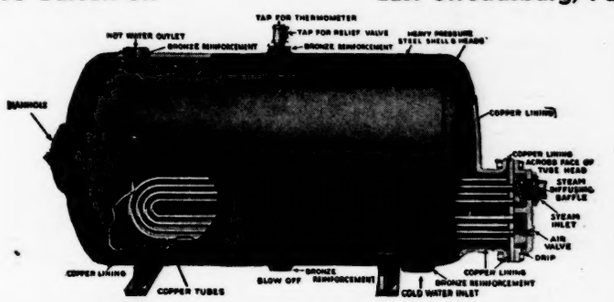
The Patterson Indestructo COPPER-LINED Hot Water Heaters in this modern apartment building at 25 E. 83rd Street, New York, can never rust and cause red water.

Moreover, they will not deteriorate from rust, therefore will outwear many ordinary heaters and yield greater returns on the investment, when measured by actual cost over years of service.

Be safe and specify Patterson Copper-Lined Heaters. Then, if necessary, you can always fall back on your guarantee that these heaters will not rust or cause red water and that they will deliver all the hot water required, as hot as required and as fast as required.

Write for our interesting catalog.

THE PATTERSON-KELLEY CO., INC.
105 Burson St. East Stroudsburg, Pa.



Patterson

Copper-Lined and Everdur Hot Water Heaters

THERM-O-TILE

at GLENSIDE HOMES

READING, PA.

A typical example of Therm-O-Tile Sectional Pipe Insulation.

Read about the employment of Therm-O-Tile Underground Conduit at this most modern U. S. HousingAuthority project. Therm-O-Tile serves as the conduit for both steam and hot water pipe lines.

Simplest
Strongest
Most
Efficient

Showing a Therm-O-Tile Pipe Saddle. Permits full thickness of insulation between pipe and roller.

Outstanding advantages possessed by Therm-O-Tile, the Conduit for Underground Pipe Lines, are: Drainage is entirely internal; Permanently dry insulation; Monolithic concrete base; No broken stone fill; Strong arched construction; No bell joints; Adjustable pipe supports; Piping and conduit are independently supported; Sealed air channels; May be opened and closed anywhere without renewing parts; and, Thermal efficiency is guaranteed under test.

Treated fully in Bulletin 381. Ask for a Copy.

Sold and installed by Johns-Manville Construction Units in all Principal Cities.

See our page in Sweet's, or, The Heating Guide.

H. W. PORTER & CO., Inc.
823-V Frelinghuysen Ave., Newark, N. J.

Without obligating us in any way, ☐ Please send Bulletin 381. ☐ Send representative. ☐ Enclosed is a sketch, with principal data of a prospective job on which we shall be glad to have your comments or quotations.

Name .....

Firm .....

Street .....

City ..... State .....

H. W. PORTER & CO., INC.

AIR CONDITIONING NOZZLES

Nozzles of unique Yarway Involute Design.

No internal parts or vanes to clog or erode.

Insure trouble-free air washing service.

Sizes and types for all requirements.

Many large users—installations total more than 5 million gallons per minute in water cooling and air conditioning service. Write for Bulletin N-615.

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YARWAY

DIRECT EXPANSION ★ COLD WATER

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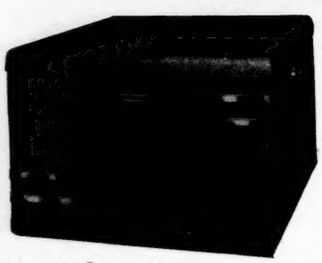

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Northwestern Terminal, Minneapolis, Minn.
Send Data on usAIRco Coil Units.

Name.....
Address.....
Town..... State.....

KNOW THE COMPANY AND THE LINE

H&V'S PHOTOS

Page 24 (upper right)—General Electric Company.
Page 28 (upper right)—Pacific Steel Boiler Corp.
Page 34 (center right)—Oil City Tank and Boiler Co.
Pages 38 and 39—Minneapolis-Honeywell Regulator Co.
Page 41 (upper right)—Truscon Steel Company.
Page 42 (lower photo)—Lawrence Bruehl, Taco Heaters, Inc.
Page 43 (upper right and lower left)—Lawrence Bruehl, Taco Heaters, Inc.
Page 46 (all photos)—Curtis Refrigerating Machine Co.
Page 47 (upper right)—American Radiator and Standard Sanitary Corp. (Center) The Gordon Armstrong Company, Silentaire Distributors. (Bottom) American Blower Corp.
Page 48 (upper left)—Ilg Electric Ventilating Co. (Lower right) American Gas Association Monthly.
Page 51—Scott Paper Company.

NEW TRADE LITERATURE

Air Conditioning. A standard size, 32-page catalog No. 8C 540, illustrating and describing the Kramer Turbo-Fin heat transfer surface. Gives information on the construction and application of this surface. Also contains information on how to select direct expansion coils and water coils. Included are a large number of tables of capacities and other data required in coil selection. KRAMER TRENTON COMPANY, TRENTON, N. J.

Boilers. A standard size 8-page catalog No. 89 on the Kewanee Hi-test boiler. This boiler is a portable tubular boiler, fusion welded for supplying high pressure steam for power and industrial application. It is suitable for all types of fuels whether solid, liquid or gas, mechanical or hand fired. KEWANEE BOILER CORPORATION, KEWANEE, ILL.

Fans. A 4-page, standard size bulletin No. 240 on Truflo fans, illustrating and describing Truflo wall fans, fans equipped with automatic shutters, pent house fans, and roof ventilating fans. TRUFLO FAN COMPANY, Harmony, Pa.

Fans. A 4-page standard size bulletin No. 206, on the Autovent Allvent fans which are designed for all types of ventilating problems. Fan is designed to supply or exhaust large volumes of air at low speeds and is said to be quiet in operation. AUTOVENT FAN & BLOWER COMPANY, 1805 N. Kostner Ave., Chicago, Ill.

Fans. A standard size, spirally bound catalog of the complete line of Emerson Electric fans for 1940. This catalog is the 50th anniversary issue. Among the types of fans described are desk fans, flow type air circulators, ceiling circulators, ventilating and exhaust fans, cooler fans and attic fans. Considerable installation information is also included. A four-page section on Emerson Electric motors concludes the catalog. EMERSON ELECTRIC MFG. CO., 1824 WASHINGTON AVENUE, ST. LOUIS, MO.

Flexible Hose. A standard size 38-page catalog G-21 entitled, "Rex-Weld and Rex Tube Flexible Metal Hose." Gives information on flexible hose, stainless steel flexible connections, stainless steel bellows, flexible exhaust hose, and fuel and oil hose. Besides giving information on construction features, the catalog presents a considerable amount of technical data and information on the use of flexible hose for conveying

saturated and superheated steam, as well as other fluids and chemicals. CHICAGO METAL HOSE CORPORATION, Maywood, Ill.

Gas Conversion Burners. A complete advertising portfolio designed specially for utilities and dealers' use in promoting the sale of the Janitrol conversion burners. This is a very complete presentation for securing prospects. Includes direct mail pieces for oil burner and stoker replacement activity, four special plan suggestions for utility and dealer reference purposes, and a series of direct mail material for general purpose mailing. This complete portfolio provides practically all of the information needed for dealers and utilities for securing this type of business. SURFACE COMBUSTION CORPORATION, ADVERTISING DEPARTMENT, TOLEDO, OHIO.

Heating Systems. A standard size 8-page bulletin S 355 illustrating and describing the Trane warm water heating system. Gives information on the new Trane warm water heating system and illustrates and describes the various parts of the system. THE TRANE COMPANY, LA CROSSE, WIS.

Insulation. A standard size, eight-page bulletin, series 400, on Duxulation, which is an asbestos protected insulation designed to insulate against heat, cold, and sound. This material is designed to be installed on the outside of the duct for reducing the heat transmission and on the inside when it is used for reducing sound transmission. Bulletin gives information on the application to cooling systems and heating systems as well as duct condensation elimination and sound correction. It also includes information on the frictional resistance when used on the inside of the duct. GRANT WILSON INC., 4101 Taylor St., Chicago, Ill.

Motors. A 4-page, standard size bulletin No. 125, illustrating and describing the Reliance fully enclosed fan-cooled induction motors. Gives information on the construction and principal features. RELIANCE ELECTRIC & ENGINEERING COMPANY, Ivanhoe Road, Cleveland, Ohio.

Refractories. A 4-page standard size bulletin No. 209, giving information on sillimanite brick, cement, and plastic refractories. GENERAL REFRACTORIES COMPANY, Philadelphia, Pa.

Rheostats. A standard size 12-page catalog R, on the Rex lines of slide-contact rheostats. Catalog illustrates and describes these rheostats which are designed for the accurate adjustment of electrical current and voltage in minute steps over a wide range. REX RHEOSTAT COMPANY, 37 West 20th Street, New York, N. Y.

Unit Ventilators. Two standard size bulletins on the Mechanovent classroom unit ventilators. First bulletin has 4-pages and illustrates this ventilator and gives installation details. The second bulletin has 12 pages and gives performance data and engineering notes. THE NEW YORK BLOWER COMPANY, 32ND ST. AND SHIELDS AVE., CHICAGO, ILL.

Valves. A 306-page catalog No. 40-S, devoted exclusively to the complete line of Crane steel valves and fittings and kindred steel specialties and accessories. Also contains a considerable amount of engineering data pertaining to high temperature piping problems. CRANE COMPANY, 836 So. Michigan Ave., Chicago, Ill.

ADSCO STEAM and HOT WATER LINE EQUIPMENT

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for UNDERGROUND or SURFACE PIPE LINE INSTALLATIONS

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Slip Type and Packless Type Expansion Joints.

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Pipe Supports, Guides, Anchors and Saddle Plates.

Condensation and Steam Flow Meters.

Storage and Instantaneous Water Heaters.

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Steam Traps and Vapor Heating Specialties.

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IN BUSINESS OVER SIXTY YEARS

YARWAY GUN-PAKT EXPANSION JOINT

It is packed under full steam pressure. By the turn of a wrench, integral pressure guns force a special semi-plastic packing into the stuffing box.

Welded Steel Construction. Alemite lubricated cylinder-guided sleeve. Made also in conventional gland-pakt types. Write for Bulletin EJ-1907.

YARNALL-WARING COMPANY
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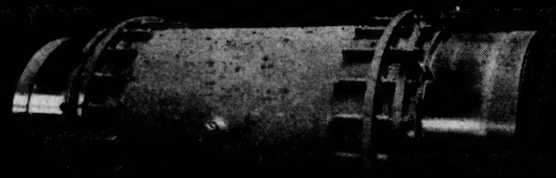
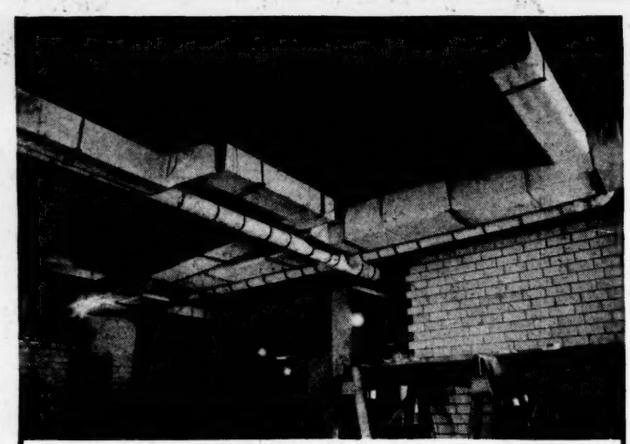


One of 40—24" Yarway Gun-Pakt Expansion Joints recently purchased by a leading automobile manufacturer. Good for 300 lbs. pressure, with welding ends and welded steel base.



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FOR AIR-CONDITIONING SYSTEMS

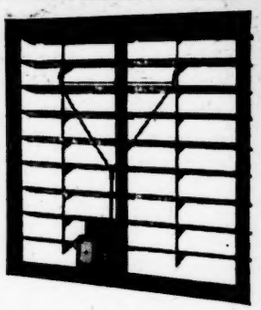
CAREYDUCT comprises both duct and insulation and is erected in a single operation . . . Fireproof; permanent; a natural sound deadener; no noise in erection; lightweight; clean appearance; easy to erect; low cost as compared to sheet metal plus insulation; permits higher velocities, thereby requiring smaller ducts. Write for Careyduct catalog—address Dept. 49.

THE PHILIP CAREY COMPANY • Lockland, Cincinnati, Ohio
Dependable Products Since 1873
BRANCHES IN PRINCIPAL CITIES

Elgo Ventilating Specialties

Get Hep to This Motorized Shutter!

Designed for attic fan installations—also for industrial and commercial use. Shutters open to 90 degrees in 6 seconds upon turning fan switch, closing tight when fan is shut off. Equipped with motor, transformer and relay. Write for circular and prices.



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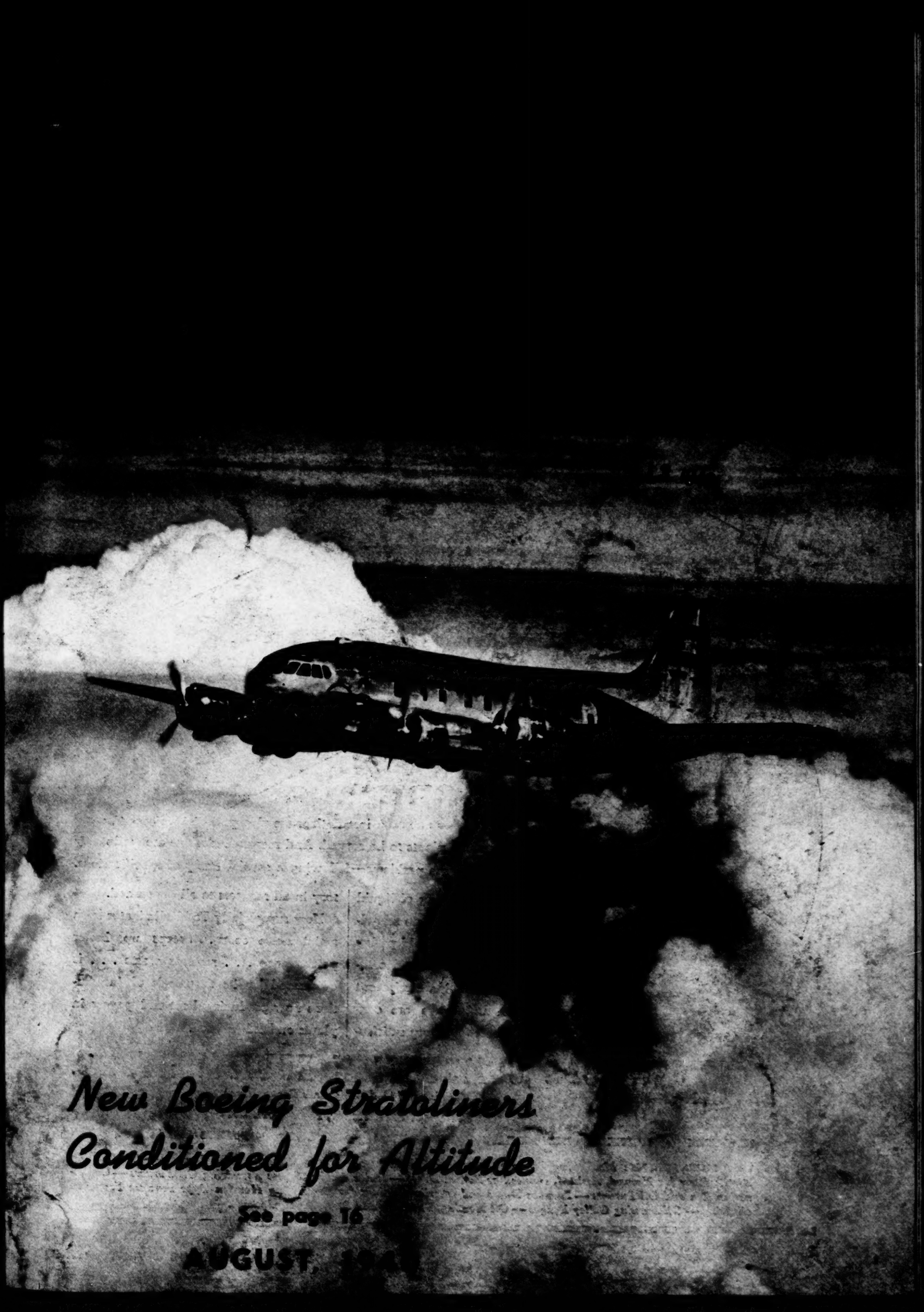

New Boeing Stratoliners Conditioned for Altitude

See page 16

AUGUST, 19[illegible]